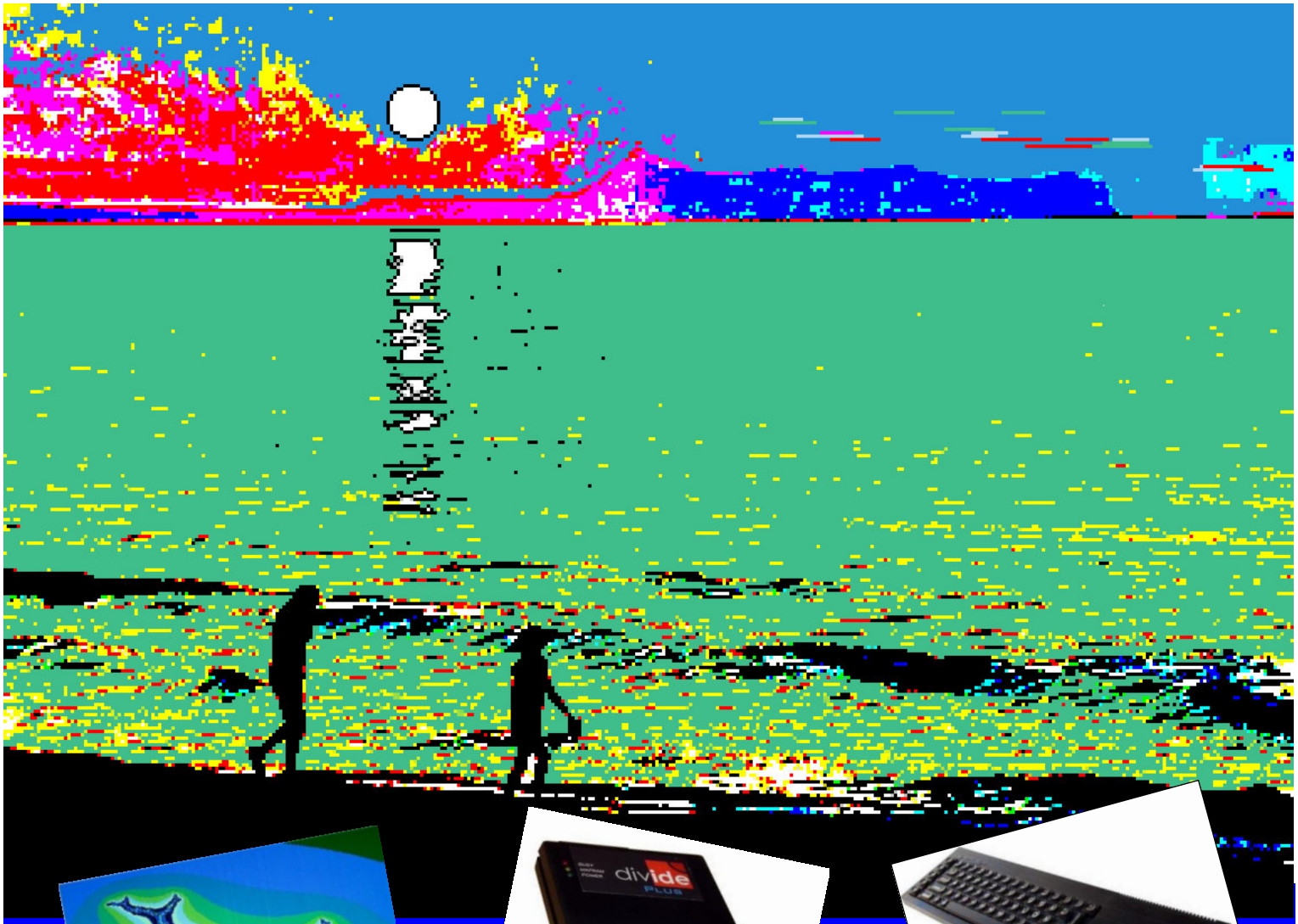
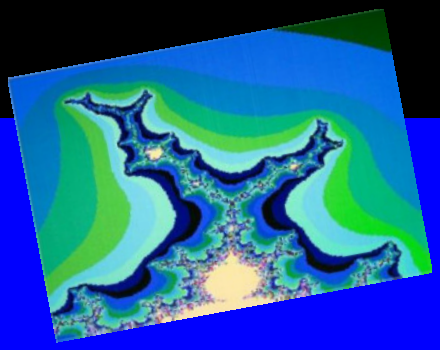
SUC-SESSION

YOUR MAGAZIN FOR THE SINCLAIR SPECTRUM





- News
- The Quite Qonfusing QL
- Adventure-Solution »*Al-Strad*«
- ZX Spectrum *ULA-Types*
- *ZX Spectrum NEXT Quick Start Guide*
- And much more ...

ISSUE

229.

OF YOUR MAGAZINE

FOR SUBSCRIBERS WITH SCENE+ DISK

THE NEWEST AND BEST PROGRAMS DIRECTLY DELIVERED TO YOU

EDITORIAL

Dear SUC readers,
In the editorial of the last issue, SUC 228, I expressed the hope and wish that the situation regarding CoVid-19 would ease somewhat by mid-2021. It seems that my hope has been fulfilled. Very, very slowly, normal life is returning. The restaurants have opened again, the cinemas are showing their movies again and concerts are taking place again. I don't know about your feelings, but for me the last year and a half seemed like three years. All the restrictions have made life difficult. We'll see what happens next - hopefully there won't be another lockdown. However, life goes on.
A few things have changed in this issue. The font has become a bit smaller and the line spacing has decreased. This change was necessary for several reasons. The size of the issue, which is still a non-professional production of the Spectrum User Club, should not be much larger than 40 pages. This issue has 40 pages, which I think is quite a lot - so I've reached my target. In agreement with Thomas, I had to change font and line spacing to ensure that all articles that should be in the magazine would fit into it, and on the other hand keep the production costs low.
It would have been possible to push out the margins a bit more, but they are already set relatively far out. Making the images a bit smaller would also have been an option. In the end, I decided for a compromise. I reduced the line spacing and the font size from 12 cpi to 11 cpi. These changes saves full seven (!) pages. In the previous format, the booklet would be at least 50 pages thick and there would be just as much inside. My goal so far has been to make the magazine easy to read, which I think I have succeeded in doing. This issue is a kind of trial magazine; whether it is successfully launched depends on your judgement.
Furthermore, the first two articles on Spectrum Next are inside. At this point I have to thank to Christof Odenthal, who edited his article three times at my request. He also contributed a basic gimmick for the Next: a program to create a fractal graphic in a maximum of 255 colours. You can find it at the end of the issue. Many thanks Christof! Your work was worth it!
Omitted is the article about a computer from my collection, the Philips P2000T. This article will appear in the next issue. As always, we, the makers of this issue, hope you enjoy reading it. Be it a PDF or on paper.

Best regards,
Joachim

September 15th, 2021

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IMPRINT

The SUC-Session magazine appears in German and English and can be subscribed together with the disk-magazine SCENE+ at the »Spectrum-User-Club«. For further information please contact Thomas Eberle.

Editor SUC-Session 227:
Joachim Geupel & Thomas Eberle

Editor SCENE+: Thomas Eberle

Club manager:
Mirko Seidel, Adresse: Birkenweg 8
89197 Weidenstetten
email: mirko.seidel1@gmail.com

This issue has been supported by:

Joachim Geupel	Joa.Geu@gmx.de
Thomas Eberle	thomas.eberle@sintech-shop.de
C.H.Perins	
Chris Smith	
Ellvis	
Harald Lack	
Christof Odenthal	
Scott-Falk Hühn	https://s-huehn.de/
Dieter Hucke	http://www.dieter-hucke.de/
Gerhard Jungsberger	https://www.jungsi.de/

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Copy deadline for SUC SESSION 230

Sunday, November 25th, 2021

READERS LETTERS

The number of letters to the editor has increased again, which of course makes us very happy. Thomas has again and as always competently taken care of the letters and answered them.
And I am writing these introductory lines only because Thomas has written nothing.
So! Have fun reading!

Joachim

A technical question have been sent from *M. Hoffmann*:

Hello dear RetroSpecialists,
I have a question about the DivMMC Enjoy! ProOne.
Can I connect this "behind" an Interface 1 and use both in parallel?
Background of the question: I programmed my own game in BASIC in 1983 and have it on microdrives and it can actually still be loaded :-)
Now, to get the code (about 3000 lines) into an emulator, I thought I could load my program from microdrive and then immediately save it to MMC, and then load the program saved this way on MMC in an emulator.
Are both processes possible?

- *Loading from Microdive and then immediately saving to MMC ? (while both are connected to the Spectrum)*
- *Loading the program from MMC in an emulator and then running the BASIC program there ?*

I look forward to your answer and remain with kind regards,
M.Hoffmann

Hello Mr Hoffmann,
mass storage interfaces such as Interface 1 or the DivMMC all work according to the same principle. The Spectrum ROM is faded out and another, extended ROM is faded in. This process alone rules out the possibility of combining such interfaces. So it is not possible.
The second thing, loading a programme from the SD card into the emulator of a computer, is possible. To do this, however, you would have to convert the basic file into an emulator file. This can be done with Claus Jahn's ZX Modules (I think the Block Editor is the right one).
The question is how to get the programme from the microdrive to DivMMC, and there is only the good old cassette... In the end, it should only take a few minutes. Sure, long if you consider how long it takes today for gigabytes. There are solutions for other storage media, but unfortunately not for microdrives.

***Matthias J.* lives near Heilbronn and got a question to his new aquired Spectrum:**

I have a problem with the screen display (see picture). The screen is connected via RGB ...
What is the problem? How can I fix it?
Thank you very much. MfG Matthias J.

It's nice to hear that there are more Spectrum fans in my area. There is no simple answer to your question. I think the problem is that the TV and the Spectrum signal just don't get along. Which cable are you using? The cable could also be faulty. Has it been tested? I have never seen such an error from the Spectrum and I don't think it can be from the Spectrum. Have you ever connected the Spectrum with a normal aerial cable?
Modern televisions do not get along with the RGB of the Spectrum. As I have seen, this Spectrum also has a video connection as an additional option. Have you tried that too? If it has to be RGB signal, then it has to be a real 50 heart RGB monitor, e.g. Commodore or Philips. Of course, there are also other models, but you can never be sure. In addition, there may be settings on the TV that are always more different.
From my point of view, however, I could be wrong: You have a modern TV that is large and converts the picture input signal. Since the TV can't cope with the input signal, it is calculating incorrectly. Maybe change the settings to 4:3 CRT or try all the settings.

***Lothar Ebelshäuser* from Kall-Scheuen has also written to us again:**

Hello Joachim, hello Thomas!
I would also like to get in touch with you again. The last mag (228) is great again. Simply great. The diskette is also top-notch. In the past I've had problems with the individual programmes (Thomas will know what I mean), but this time everything works great. And the cover picture is really Spectrum-like.
Nevertheless, I also have a question. For some time now, I have also owned a Spectrum Next. Although Dieter Hucke has helped me a lot, I still lack a lot of knowledge about this computer. Is it perhaps possible to work towards a German manual via the club.
The knowledge of English varies.
Many greetings from the Eifel, Lothar Ebelshäuser

Hello Lothar, we solved the problem of sending floppy disks by wrapping them in aluminium. Since then, the data has arrived undamaged. Other readers are also welcome to contact us if they have more problems reading the floppy disks. We will find a solution.
This issue contains a first article on the Spectrum Next, a start. The operating manual is of course very extensive and it would be very time-consuming to translate it, but a kind of course explaining a few tricks of the Next is a good thing. We would be happy to receive more articles on the Next, the need is there.

A message from Leif Mortensen reached us from Denmark:

Hi. Many years ago I had a Danish Sinclair club - »Sinclair Freakeren« - it excisted from 1988-start 1995. Then I had a lot of other things to do and I didn't think much about the Spectrum. Gave my collection to a local museum around 2014. They had to move location and under that operation they "lost" my collection. Then in August 2020 I was made interested in the Kickstarter project about a remake of the old ZX Spectrum computer - The ZX Spectrum Next. I joined the project paid for it and awaits my copy in August last year. I don't know if you're interested in reestablishing the contact with me when I'm up and running again with my Next. Let me know what you think. Kind regards,
Leif Mortensen

Hi Leif, I remember the Sinclair Freakeren. Over the years I have seen many clubs and magazines. In fact the »Spectrum User Club« is the only one I know of that has always existed. Personally, the internet has replaced many contacts I used to have as pen pals. I welcome that though, communication is faster and usually better. Still, my Spectrum hobby is reduced to a few days a month, much of that time I devote to the club, testing games or writing articles. That means the best way of communicating with me and us as a group is through our magazine. Whether you want to contribute or just read along, it's up to you. We are happy to welcome you in our midst, whoever contributes gets our common product, the magazine, for free.

We remain international; this message from *Hugo Bonilla Herrera* reached us from Chile:

Hello friends of SCENE+.
My intention is to ask first and then buy. What does the floppy disk consist of or what does it contain? I am the owner of a ZX Spectrum +2 (gray) and I have a disciple with a 3.5 " floppy disk drive, please tell me this, I am from Chile.

Many greetings to Chile.
The *Scene+* is the only magazine I know that really offers a real disk. But you can't subscribe to the SCENE+ separately, only in combination with our A4 magazine. In the annual subscription you get three magazines (paper or PDF) and 1 disk (real or TAP format). You can also mix the two, i.e. PDF and real diskette or paper magazine and TAP. The easiest way to subscribe is to go to

www.speccy-scene.de.

Our disk does not just contain versions of games that can be downloaded from the internet. The programmes are adapted and converted to the disk systems (Opus or Disciple/+D). In some cases you don't have to add much more than disk commands, in other cases loader routines have to be completely rewritten, so it's not a little work. Fortunately, we have specialists. The selection of programmes ranges from programmes sent to us by our readers, to special versions provided by programmers, as well as software that is simply freely available on the internet and which we adapt. In most cases we include demos and games, in rare cases we also include utilities. It is always a selection of programmes of the respective years, whereby of course more good programmes appear than we can pack onto a disk.
Especially for +D/Disciple we are the only source for new programmes. We would be happy to welcome you as a reader.

We do not yet have an address for *Jay Mundy*, at least he is from the English-speaking world:

Please add me to your mailing list. I am interested in ordering and contributing to the English version magazine for ZX Spectrum. Please email me any info I would need. Thanks.

Hi Jay, I have sent you information about our magazines. We don't have a mailing list, but if you want to contribute, just write to me. You will then get points per article and can exchange these points for a subscription, so our helpers are rewarded for their cooperation.

***Claudius Rebhan* from Peiting is interested in programming:**

Hello! Do you have a simple programming book for Spectrum,and Spectrum Next in German?
Greetings, Claudius Rebhan

There is a lot there for the Spectrum. What would you like to learn? Basic? Machine code? There are also a few books in the Sintech shop.
For the Next there are no books except the manual, but the manual is actually already a book and explains everything. In addition, there will hopefully be more and more articles on this topic here in the magazine.

So, that's it for this time with the letters to the editor.
Letters to the editor as always to Thomas by email :

thomas.eberle@sintech-shop.de

NEWS IN SHORT

SPECTRUM NEXT SD MICRODRIVE

Not really a microdrive, but an external SD card slot solution in a nice design is offered by "Active Next". You can buy it for 30,00 GBP here:

https://store.activeconsult.co.uk/shop/ols/products/zx-spectrum-next-slash-n-go-external-j13-breakout-board

Please note: The UK is no longer in the EU. Purchasing items in the UK will incur import charges.

SPECTRUM NEXT PRODUCTION AND UPDATE:

While it has been pointed out that there are delays in the trade worldwide especially in IC procurement, the NEXT team has not yet commented on whether this will delay the estimated delivery in August 2021.

For the final release, they are still fighting with the CE conformity (we reported). We can only hope that everything works out and all customers get their computers. At least: There soon will be another system update with many new features.

The current version of the system is V.1.3.2 with the firmware is V1.29b, that of the core is V3.01.05. It can be downloaded from the Next page at:

https://www.specnext.com/sn-1-3/

SPECTRUM GAMES OF THE 80S

In the Suc-Session we always present new games. If you want to know more about the commercial releases of that time, this book will help you:

"A guide to ZX Spectrum games" contains not only games, but also interviews with the people involved at that time. It's in English, but also available in Germany via Amazon:

1982-1984:
https://www.amazon.de/Guide-ZX-Spectrum-Games-1982/dp/B08T7524P3

1985-1986:
https://www.amazon.de/Guide-ZX-Spectrum-Games-1985/dp/B08STLPNK4

1987-1988:
https://www.amazon.de/Guide-ZX-Spectrum-Games-1987/dp/B08ZBPK6HS

The books really cover a large number of games, but completeness will probably never be possible.

THE QUITE QONFUSING QL -
THINKING OF GETTING INTO THE SINCLAIR QL IN 2020?
BY C.H. PERTKINS

I was about 8 when my uncle gave me his 'obsolete' Sinclair QL, complete with the original Psion software. I found the microdrives fast and novel (and reliable, despite what many say). The QL was the first time I had ever loaded software from removable media, as up to that point I had used a ZX81 and didn't even have a tape recorder to save/load stuff with! As a child though, all I had was the Psion suite of word processor, database, spreadsheet and business graphics and they didn't hold my attention for all that long. I had no idea where to obtain further software for it and the huge, very adult user guide went mostly over my head (much of it still does)!

A Sinclair QL

Now that some of my generation are re-discovering retro computers for reasons of nostalgia, or simply to try out the computers your mates had that you couldn't possibly have expected your parents to buy or could have ever afforded from your paper round money (if you were lucky enough to have one computer, that would have been expensive enough). There is increased interest in original 1980s hardware in general and therefore also in the Sinclair QL. Over about the last couple of years, I have collected quite an assortment of original QL related hard- and software and have even learnt how to use some of it. The Sinclair QL was designed and sold in the 80s - things were much simpler in the 80s, weren't they, so how hard can it be? I have personally found that re-discovering or attempting to properly get into the Sinclair QL for the first time can be a daunting affair, at least it has been for me.

HISTORY

The original QL (i.e. the original black long Sinclair computer) was an advanced machine for the time and it was very much aimed at the more advanced potential user. It was originally favoured by some business users, programmers, teachers and generally very clever-stick type people that understood the ins and outs of a data bus and the whys and where's of a file header. It was not aimed or designed for general home use by plebs like me and my mates at school.

In its original form it was essentially flawed on a few levels, due to it being rushed and perhaps a lack of foresight in some respects. Unfortunately, it also had a short lifespan and was cast aside after about two years of mediocre sales in 1986, by Sinclair's new owner Amstrad, in favour of the technically inferior but commercially massively successful ZX Spectrum range of computers (used primarily by the mere mortals, mainly kids, for shooting aliens and stuff). The ZX Spectrum lived on for another 6 years after the demise of the original QL.

(n.b. In case you were unaware: Apart from the general similarity of appearance for some models, the Sinclair QL is absolutely nothing like the ZX Spectrum. They have completely different processors, the software is not compatible, the operating system is totally different, and you can't load or save anything using cassettes/sound input! I think some seem to think that just because they had a ZX Spectrum in the day, that they will be able to take a QL, plug it in and do Spectrummy stuff with it. You can't.)

But despite the demise of the actual QL computer, the QL story was far from over. Companies and individuals continued making and selling hardware and software for the original Sinclair QL computer. Even without the support of large corporations or massive financial resources, some plucky chaps improved upon the essence of the QL, fixed many of the bugs and shortfalls and added a host of modern features. Amazing hardware add-ons were produced, which turned the QL into a computer that was more than capable of keeping up with other types of mainstream

computers throughout the 1980s and 1990s. That massively improved hardware could make better use of more powerful software and that was also provided, in the form of new QL flavoured operating systems. The add-on hardware for the original black box was ultimately followed by entirely new QL based standalone computer systems and then emulators which were (and still are) capable of turning almost all other types of computers into a QL compatible system.

AND NOW

Fast forward to 2021 - The original QL and its successors are perfect for those like me, who seem to feel the need to fill their living space with retro-computer nostalgia. Some QL related items are also quite collectable and there are collectors for everything, but the point at which QL based hardware stopped being useful everyday computers (albeit, even from the offset for a fairly small number of niche users) was probably about the early 2000s, at about the time that the internet, or more specifically the world wide web, became mainstream and something that people had grown to expect from home computer systems - which is nevertheless quite remarkable for a system that was introduced in 1984 in a rush and had no official support by its manufacturer after 1986! Over the last decade or so the chatter and development around the QL has subsided and looking around online there are quite a few dead links to various websites and companies that no longer appear to exist. There are however, still a few very good sources of QL information online, places to buy related hard-/software and there are a handful of die-hard hobbyists still tinkering away in their spare time, invariably for very little financial reward.

QL PROS AND CONS:

Pros...

- The QL is very suited to programmers and other technical people, to experiment with or as a learning aid.
- It had advanced features for the day.
- It's SuperBASIC/QDOS is powerful and gives a real feel of getting a computer to do stuff manually from a command line.
- A lot of previously commercial software titles are now free.
- They came with a comprehensive user guide in a large black binder.
- They also came with a suite of Psion software, which was very capable. Bundling software with a computer was quite a new concept at the time.
- There is software that sets up a windows-like environment and you can even use a mouse.
- There is a dedicated bunch of very knowledgeable people that are happy to help with technical queries.
- Hardware availability of spare parts is pretty good and most of the things that tend to fail (e.g. keyboard membranes) are obtainable.
- Some hardware improvement add-ons are currently being re-manufactured.

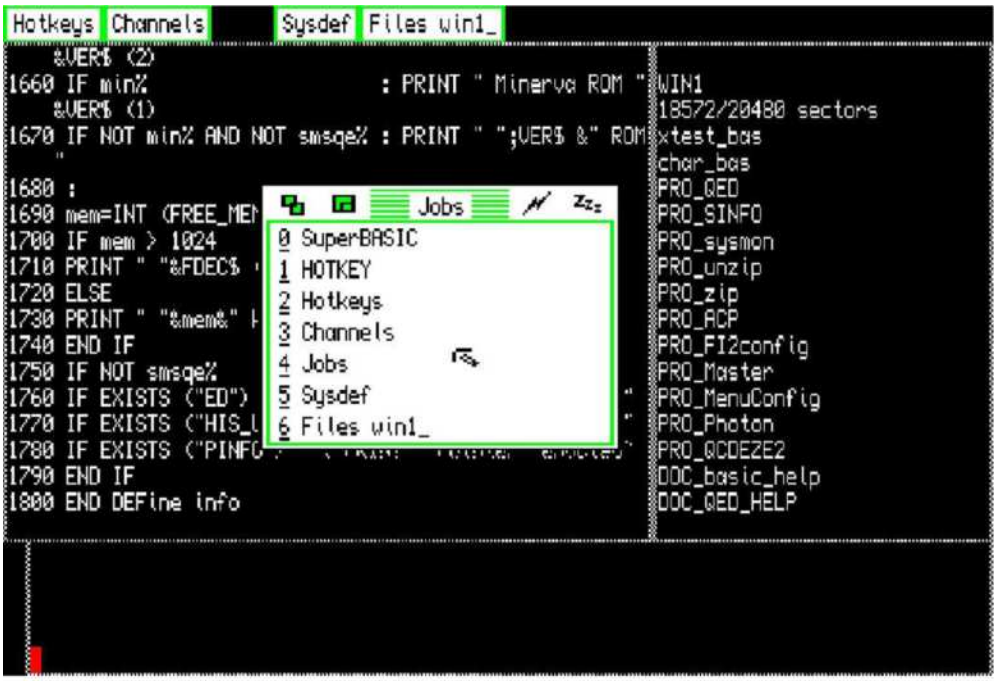
The wallet containing the free Psion software

Cons...

- Steep learning curve to get into (for many).
- No easy access to the internet directly from any form of QL based hardware. Difficult to find and

setup a compatible mouse.

- Not suitable for people that aren't clued up on computers in general (remember how hard it used to be to get stuff to work on any computer, before everything just plugged-in/installed and functioned straight away!? It's rather like that. Things were not as intuitive back then).
- There wasn't a huge amount of software produced for it (compared to other systems) and there are some things that are not freely available (still under copyright, and either the copyright owners haven't given permission, are not responsive to queries or the current copyright ownership is not clear)
- The original Sinclair QL is rather limited - to improve it can work out expensive and will result in something only marginally more useful, but certainly more fun!
- Getting software from a modern computer onto a QL is tricky to say the least, especially for the original QL which just has twin microdrives as storage devices. QL's equipped with 3.5" floppy drive(s) are slightly easier to move data to, but who has a PC with a standard floppy drive attached these days? (and an original drive is preferred as many USB floppy drives don't cut it). The only way to get stuff onto an original QL without buying extra hardware, is via a custom serial cable terminating at the QL end, in a non-standard BT type plug (German and USA models had different sockets). That is in itself a tricky undertaking and modern PC's don't have serial ports anymore either, so a USB to serial port adapter is also required.



A QL Screen running Pointer Environment and QPACII

The top of a Sinclair Microdrive Cartridge

AND THEN...

You take what was originally a fairly complex computer system with new features that was designed for serious/business users, add a whopping dollop of hard- and software evolution over 20+ years and you end up with a load of incomprehensible acronyms and terminology that can be confusing in the beginning. Here are some important QL related terms that you are likely to encounter:
Stuff mainly relevant to the original black box QL (often referred to as the BBQL):

QDOS - is the original OS found inside the QL. It is one of two things that are found on the QL's internal ROM chips (the other being SuperBASIC). *QDOS* is what allows the QL to interact with the drives, processes, memory and device drivers.
SuperBASIC - is an advanced variant of the BASIC programming language, which included some nifty extras, including structured programming features. SuperBASIC also works with *QDOS*, as it's command line interpreter. Both SuperBASIC and *QDOS* are 'hard coded' into every QL (in the ROM chips).

Minerva - is an improved version of *QDOS* with some SuperBASIC enhancements. Originally it was a physical replacement ROM chip that you had to plug in to your QL. It was a very popular upgrade at the time.

Hermes - refers to the *Hermes* chip, which was a clever replacement for the original *8049* co-processor chip in the original QL. With a Hermes chip plugged-in to substitute the *8049* there are marked improvements to the QL. The most significant are probably the reduction of keyboard 'bounce' and the newly gained independence of the 2 serial ports, which are no longer both tied down to the same baud rate (useful for using e.g. both a mouse and printer at the same time).

Toolkit II - was originally sold by Sinclair in 1985 as *»QL Toolkit«*. It is generally accepted as a must-have addition to the original QL. It extends *SuperBasic* in a few useful ways, including adding support for wildcards and generally making a lot of tasks much easier to undertake. It was also included "built-in" to several hardware add-ons. It is now available for free.

Pointer Environment (or PE) – Consists of 3 files and provides a pointer which can be controlled by cursor keys or a suitable mouse, a window manager and hot

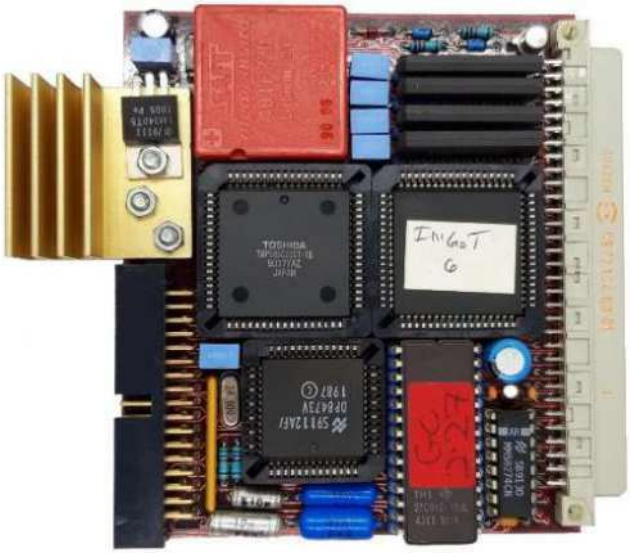
key (shortcut) system. *Pointer Environment* can be obtained free of charge.

QPAC(II) - stands for *»QL Pointer Accessories«* and is a set of utilities that run under the *Pointer Environment*, basically resulting in a windows-like graphical user interface with menus for the QL and QL based systems. *QPAC 1* was the first version. *QPAC 2* came later but offers different features (it is not a newer version of *QPAC 1).* Both are now available for free.

FURTHER QL RELATED DEVELOPMENTS:

Trump/Gold Card/Super Gold Card - are hardware add-ons that plug into the QL's left hand expansion port. They modernised the original system helping to A

keep it fresh throughout the 1980s and well into the 1990s by providing a floppy drive connector, more RAM and means to attach a mass storage device (in the case of the Trump card). The Gold and Super Gold card added considerably more RAM and a faster processor which rendered the internal QL processor redundant. There were also other expansion cards that just added RAM or a floppy drive connection.



An original Gold Card from 1990

SMSQ(/E) - is an operating system developed by the same man that was responsible for QDOS while working for Sinclair. It stands for "Single-user Multitasking System" with the "Q" representing QL and the "/E" denoting that it is "Extended" (There was an older version that was just called SMSQ). It cannot be used on an original unexpanded Sinclair QL, as it requires more than the 128k RAM and a faster processor (i.e. minimum Gold or Super Gold card).
GD2 – stands for “Graphic Device Interface 2” and introduced (in version 2.94 of SMSQ/E) support for 16-bit realistic colour display (65536 colours) for the first time.

QXL/QXL2 - was an ISA expansion card introduced in the mid 1990s. Once inserted into a spare ISA slot in a host IBM compatible PC, it takes over the PC and turns it into a QL compatible system! The QXL/QXL2 had access to the PC's devices and connections, like the floppy drive(s), serial ports and it was able to create and have exclusive use of a special portion of the PC's hard drive. They used SMSQ/E (or its predecessor) and had up to 8mb RAM on board.

Aurora – was a replacement QL motherboard that could fit inside an original black QL housing but was also used within custom PC type cases. It had various improvements and was designed to be used with a Gold or Super Gold card (as it lacked its own processor chip).

Q40/Q60/Q68 - are all complete motherboard systems with faster processors and much improved graphics and sound capabilities compared to previous QL compatibles. Much like buying a PC motherboard in the

A QXL 2(B) card from the late 1990s

1990s, the Q40/60 were originally designed to be built A QXL 2(B) card from the late 1990s into a standard AT case and used standard 16-bit ISA I/O cards to provide HDD, FDD and serial ports etc. The successor and the only one still available to buy new is the Q68, launched in 2017. It's very compact (a bit like a Raspberry Pi in appearance) and is supplied with the SMSQ/E Operating system and SD card sockets for mass storage. It is strictly a hobbyist product, is special order only and there is sometimes a short waiting list as they are not produced in high numbers. Internet access is possible, I think, but only just (and seems very complicated to setup and not very practical for those used to all computer devices having easy internet connection capabilities – although I haven’t personally tried it).

QPC - is a QL emulator for IBM compatible PC's (and Mac OS X). The first version QPC1, was developed for and only runs within an MS-DOS environment. QPC2 is a native win32 program and can run on Windows including Windows 10. It's available for free, runs SMSQ/E and is the easiest and quickest way to try out SMSQ/E! Other very good QL emulators are available.

Text and images © C H Perkins, January 2020,
updated February 2021.

ZX SPECTRUM ULA TYPES

BY CHRIS SMITH

INTRODUCTION

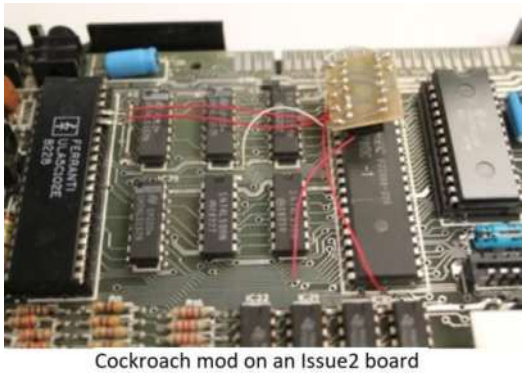
At the heart of the ZX Spectrum computers is a special chip called the ULA (Uncommitted Logic Array). This technology was developed by Ferranti, and Sinclair was one of the early adopters of this technology. All of the discrete logic of the ZX80, as well as circuitry to generate the NMI, was integrated into the first ZX81 2C158E ULA.

The 16/48K Spectrum has a number of different ULA types:

5C102E ULA

This was the original ULA type found in Issue 1 and in a small number of Issue 2 Spectrums.

It suffered from a faulty I/O contention model that made I/O reads, especially keyboard reads from machine code, unreliable. Therefore, the "cockroach" mod was added, basically a 74LS00 chip soldered freewired to the board and later included on its own mini daughterboard.

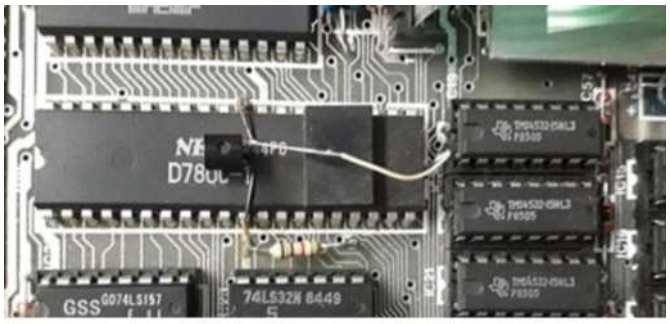


Cockroach mod on an Issue2 board

5C112E, 5C112E-2, 5C112E-3 ULA

This was the second revision of the ULA and can be found in Issue 2 of the Spectrum. It fixed the initial I/O contention problem, but unfortunately it turned out that the resulting I/O contention was overly aggressive and occupied ports that it should not have.

This led to the implementation of the "Spider" mod, a ZTX313 transistor soldered above the CPU, or in some other versions, next to the top RAM ICs. In the early conversions, the mod was done with a single diode and resistor.



Spider-Mod on Issue-2-Board

Due to the lack of available pins to properly fix this problem in later ULA revisions, this transistor was integrated into the board as TR6 and is found on the board from Issue 3 and later versions. When the transistor is not present, the machine functions properly, except for the lack of a floating bus effect (see this article for a more detailed explanation).

It is currently unclear what the differences are between the original 5C112E and variants -2 and -3.

6C001E-5 ULA

This is a comparatively rare revision and appears to be Sinclair's first attempt to use Ferranti's new 6C process to reduce the power consumption of the ULA. The timing changes introduced in this revision improve compatibility with some previously problematic TVs, but at the cost of shifting the entire screen display one character position to the left. This can be seen when the border turns black.

This ULA also includes a change to the internal pull-up resistors that causes the EAR bit value to hover between 0 and 1 until the ULA is warmed up, instead of remaining at a logic 1 as with the 5C series. As a result, software that reads the keyboard without masking the non-keyboard data bits will not function properly.

Machines with this ULA typically have a small capacitor installed on the lower RAM /RAS line, presumably to compensate for the marginal timing on this signal generated by the ULA.

These are found exclusively in late Issue 2 boards and have date codes between 8320 and 8324.

6C001E-6 ULA

This is the first mainstream revision of the 6C ULA type, found in late Issue 2 boards and most Issue 3/3B boards. It presumably corrects the /RAS timing problem that the 6C001E-5 ULA exhibits. No other differences are known.

6C001E-7 ULA

The latest revision of the 48K ULA. It improves memory signal timing in conjunction with modifications that begin with the Issue 4A issue. This is the only ULA documented to work on all 48K issues.
Some very late 6C001E-7 ULAs carry 'PS' markings or the Plessey 'squiggle' logo. These were made after Plessey took over the Ferranti semiconductor business in 1988, and were probably the last ordered by Amstrad for authorized repair centers.

7K010E-5 ULA / AMSTRAD 40056

This ULA type was produced for the Spectrum 128 and later for the Grey +2. Despite the different designations, they are functionally identical. Other major differences are the RGB output instead of YUV and the separate MIC and EAR pins, although they are tied together on the board to emulate the original behavior!

+2A/+3 GATE ARRAY (AMSTRAD 40077).

Not an ULA, but an Amstrad-produced gate array that combines the functionality of the ULA, PCF, and HAL chips in a single package. It comes in QFP form instead of the traditional DIP.

WHICH ULA WORKS IN WHICH MACHINE?

The ULA 6C001E-7 is backward compatible with any 48K machine from Issue 1 to Issue 6A. For other ULA revisions, the following applies:

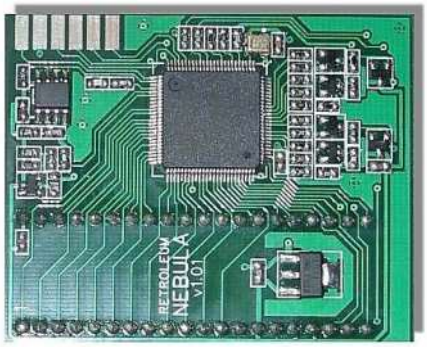
- 5C102E - Issue 1 and 2 PCB's,
- requires the »roach mod«.
- 5C112E - Issue 1 PCB's, remove the roach, and issue 2 PCB's.
- 6C001E-5,6 - output 1, 2 and output 3 PCB's.

Other combinations may work (I have seen a 5C112E ULA work in an issue 6A with no problems), but the above combinations are the ones officially documented and supported in the service manual.
For 128/grey +2 machines, the 7K010E-5 ULA and Amstrad 40056 IC's are interchangeable with no modifications required.
The +2A and +3 both use the same 40077 gate array.

REPLACEMENT ULA'S

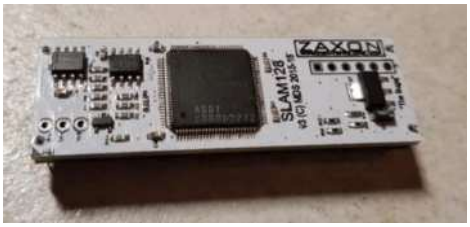
Since the process used to manufacture the ULA chips is decades old and outdated, new ULA's have not been available for several years. Replicating functionality has proven difficult because Sinclair uses ULA peripheral cells to provide analog functionality such as YUV output, tape interface, and so on. Nevertheless, replacement units have come to market in the last year and are described below.

NEBULA



A drop-in replacement for 6C001E-7 and earlier ULAs that replicates the functionality of 6C001E-7. Developed by Phil Ruston and Alessandro Dorigatti. The NebULA is considered relatively hard to find. However, it is worth checking Sintech, Sell-my-retro and retroleum to see if it is available.

SLAM 128



A drop-in replacement for the 7K010E-5 ULA in 128 machines or the Amstrad 40056 in gray +2s, designed by Mark Smith and manufactured by Piotr Bugaj. Usually available on sellmyretro.com (search for seller zaxon, keyword SLAM 128 ULA).
https://www.sellmyretro.com/offer/details/slam-replacement-ula-for-sinclair-zx-spectrum%2B128-~~-spectrum%2B2-21779

VLA82, VLA128

A replacement for the 6C001E-7 and earlier ULAs, vLA82 for 48K, and for the 7K010E-5 and Amstrad 40056 ULAs, vLA128, 128K.
Designed by Charlie Ingley, these can generally be found on SellMyRetro.com, though expect them to be unavailable at this time. See this link for more details.
https://vdrivezx.com/2019/06/18/vla-news/

SPECTRUM +2A/B AND +3

No replacement is currently available for the 40077 gate array used in the +2A and +3 Spectrums, fortunately these are usually quite reliable.

FURTHER READING

More information about the Spectrum ULA can be found in Chris Smith's excellent book, The ZX Spectrum ULA: How to Design a Microcomputer.
The book is available for purchase on Amazon for just under $30.

Chris' blog describing his journey to reverse engineer the ULA functionality can be found here.
http://www.zxdesign.info/

The following photos are from the internet. The links are:

Cockroach Mod:
http://www.computinghistory.org.uk/det/32957/ZX-Spectrum-Issue-2-With-ULA-Modification/

Spider mod:
https://cybre.space/@terceranexus6/105645204281675412

Amstrad-ULA:
https://www.worthpoint.com/worthopedia/amstrad-ula-40056-spectrum-128k-1774722897

SLAM 128:
https://archiwum.allegro.pl/oferta/slam-ula-do-zx-spectrum-128-i9706109461.html

VLA82:
https://www.tindie.com/products/charlieingley/**vla82-spectrum-48k-ula-replacement/**

VLA128:
https://zxrenew.co.uk/ZX-Spectrum-128k-replacement-ULA-p151287561

7K010E-5 ULA:
Joachim Geupel or
https://www.bytedelight.com/

All other photos ULA:
https://www.bytedelight.com/

Many thanks to *Ben Versteeg* for the ULA photos.

»THE DIVIDE PLUS« - PART 3

BY SCOTT FALK HÜHN

In the previous parts you learned more about the hardware and the software of the DivIDE. In the third and last part Scott goes deeper into the software and explains how to install a new firmware on the DivIDE Plus.

MORE FIRMWARE

As described in the previous part, the DivIDE Plus comes with 5 pre-installed firmwares. However, there are a few more, some of which were released after the DivIDE Plus was developed and therefore have not been included. You can install these on the DivIDE Plus as well, but it's not quite as easy. This is mainly because these firmwares are intended for the plain DivIDE and not for the DivIDE Plus. Such a firmware package is distributed as a TAP file and always consists of a BASIC part, which contains a small program to write to the DivIDE EEPROM, and an 8kB firmware file. If one tries to install such a TAP file on the DivIDE Plus, then the MAPRAM mode is activated and the firmware is written into the RAM. You can use this possibility to try out a new firmware. However, this only works as

long as the Spectrum remains powered on. After a power interruption, all data is still in RAM, but the firmware stored in the flash memory is activated again. However, there is a special program for the DivIDE Plus that can be used to install any firmware files permanently in flash memory: the Flash Utility. First, however, I would like to briefly introduce the most interesting firmwares.

FIRMWARE SELECTOR

The Firmware Selector is a kind of boot manager that was written especially for the DivIDE Plus and can be installed directly without any other tools. At the first start after the installation a menu appears where the desired firmware can be selected at system start or after a reset, furthermore the spectrum mode (48k or 128k) can be set here. This selection is saved permanently and in the future the DivIDE Plus will always start the preset firmware. If you want to change the settings, you can press and hold the "1" (number one) key during system startup to return to the selection menu. Basically the manual selection of a firmware via the OUT command remains. However, it must be noted that FATware has been moved to another memory bank and is now activated with OUT 23,28.
The Firmware Selector is in principle a nice thing, but it is not available for free. One can buy the Firmware Selector from RWAP Services via the SellMyRetro platform [https://www.sellmyretro.com] for £6. In practice, it has been shown that if you change firmware frequently, the OUT command will get you there faster. Also, the Firmware Selector always performs a PRINT USR 0, which leads to a re-initialization for some firmwares and resets some settings (e.g. a selected directory or the last position in the NMI menu). For this reason I removed the firmware selector from my DivIDE Plus again. For this purpose, a de-installer is included, which then also puts FATware back to its original location.

FATWARE 0.14A3

The version of FATware preinstalled on the DivIDE Plus dates back to 2005. In the meantime, several other versions have been released by Velesoft

[https://velesoft.speccy.cz/zx/divide/divide-fatware.htm],

promising some improvements. However, it is difficult to recommend a specific version, as there is no continuous development and different branches have formed.
On the Czech homepage of DivIDE

[https://divide.speccy.cz]

another relatively recent version of FATware is offered for download (FATware 0.14a3). Here some problems of the version 0.12 were eliminated and there is now a POKE function, which can be called with SYMBOL SHIFT + P. In addition, the list in the Disk Browser can now be scrolled forward or backward page by page with the keys "5" and "8" and with "1" you can quickly get back to the beginning of the list.

ESXDOS 0.8.8

ESXDOS is a very extensive firmware, which is not only available for DivIDE, but also for DivMMC and MB03+. The DivIDE version can also be used on the DivIDE Plus. A complete package for the simple DivIDE can be downloaded from the ESXDOS homepage [https://www.esxdos.org/index.html].
ESXDOS can handle media in FAT16 and FAT32 format, both read and write. Unfortunately, long filenames are not supported, but that may yet come, because development is not yet complete. ESXDOS contains an emulation for virtual tapes (reading and writing) and an emulation for Betadisk/TR-DOS. A special feature of ESXDOS are the so-called dot commands. These are additional commands that can be added to the system relatively easily and start with a dot. There are also additional modules such as a greatly expanded NMI navigator.

BS-DOS 309

This firmware comes from the MB02+ interface and has been adapted to the DivIDE. BS-DOS does not use a known file system and accesses directly the sectors of the medium (CF card or hard disk). It works with virtual floppy disks, which can have a size of up to 2MB. Altogether up to 255 disks are administered.
On the BS-DOS homepage of Velesoft
https://velesoft.speccy.cz/zx/divide/divide-bs-dos.htm
you can find the installer for BS-DOS, which also offers an installation possibility for the DivIDE Plus. In order to be able to work with BS-DOS, a medium must first be set up. For this it is necessary to create a special partition on the CF card or hard disk. This can be done with suitable programs directly on the Spectrum. More information can be found in the download package of the installer. For me this was a bit too complicated and since I don't own a MB02+ myself, I didn't test this firmware on the DivIDE Plus. BS-DOS is interesting though, as it obviously bridges to the MB02+ and allows data exchange.

THE OUT 23 COMMAND

The DivIDE Plus uses the already mentioned port 23 mainly for memory management, but it offers even more functions. It is a pure output port, i.e. values only can be send with OUT 23,xx. Reading the port with PRINT IN 23 is possible, but always returns 0 as result. The developers have given some thought to memory management and it is quite interesting to look at these possibilities.
Since individual bits of port 23 have a specific function, the value to be output should always be considered binary. The two most significant bits 7 and 6 have a special meaning: They determine the mode of the DivIDE Plus, and the remaining bits have a function depending on it.

DIVIDE MODE (BIT 7 = 0, BIT 6 = 0)

In this mode, the entire memory of the DivIDE Plus is parted into 16 areas with 32kB ROM and 32kB RAM, and in each of these areas a
Firmware can be installed. The following overview shows how the parameter of the OUT 23 command can be set, to choose a specific storage area and thus a specific firmware to select:

```
Bit 7 ... 0\ DivIDE Mode
Bit 6 ... 0 / activate
Bit 5 ... 0
Bit 4 ... \ Selection of the range
Bit 3 ... \ Selection of the range
Bit 2 ... / Selection of the range
Bit 1 ... / Selection of the range
Bit 0 ... 0
```

Bits 4 to 1 determine the selected range.
Within such an area, the DivIDE Plus behaves like a classic DivIDE and works in the so called compatibility mode. In this mode, the last 8kB Block from the available 32kB ROM in address range 0-8191 ($0000-$1FFF) is paged in, while the 32kB RAM is again divided by a Bank switching into 4 blocks, each block 8kB large.
One of these blocks is then paged to the address 8192-16383 ($2000-$3FFF). For this the I/O port 227 ($E3) is needed, which is used by the firmware itself, in case that it uses the bank switching.

By the way, all this is also realized with the simple DivIDE.
This mode is used by the following firmwares:

- **OUT 23,BIN 00000000 (OUT 23,0)**
- **FATware on range 0 (firmware Selector is not installed)**
- **OUT 23,BIN 00011100 (OUT 23,28)**
- **FATware on range 14 (firmware Selector is installed)**
- **OUT 23,BIN 00000010 (OUT 23,2)**
- **DEMFIR on area 1**
- **OUT 23,BIN 00000100 (OUT 23,4)**
- **+DivIDE on area 2**
- **OUT 23.BIN 00000110 (OUT 23.6)**
- **MDOS3 on area 3**

A special variant of the DivIDE mode is the MAPRAM mode. Here a special memory configuration becomes active, which masks a RAM bank instead of the 8kB ROM in the address range 0-8191 ($0000-$1FFF). This results in a continuous 16kB RAM block in the lower memory area of the Spectrum. This allows the installation of a firmware in the RAM.
No special activities are required to install a firmware in MAPRAM mode. If the message to remove the write protection jumper appears during the installation, it is simply ignored and ENTER is pressed. Thereby the installer activates the MAPRAM mode via the already mentioned port 227 and the firmware is installed in RAM.
By the way: the firmwares DEMFIR and MDOS3 also switch to MAPRAM mode after startup. The activated MAPRAM mode can be recognized by the glowing of the yellow LED. It can only be exited by a DivIDE reset via OUT 23,192 (explanation to follow) or by switching off the power supply.
The DivIDE manual mentions another special case: the DivIDE Plus 128k mode. However, I couldn't find out yet what this mode can be used for. The 128k mode is activated by the following bit assignment:

```
Bit 7 0 \ DivIDE Plus
Bit 6 0 | 128k mode
Bit 5 1 / enable
Bit 4 0
Bit 3 0
Bit 2 0
Bit 1 0
Bit 0 0
```

This corresponds after decimal conversion OUT 23,32

RAM MODE (BIT 7 = 0, BIT 6 = 1)

In this mode, the DivIDE Plus uses only the RAM and divides it into 32 areas of 16kB each. These 16kB pages are completely mapped into the address range 0-16383 ($0000-$3FFF), resulting in a continuous RAM for the Spectrum in the entire address range. The following overview shows the composition of the parameter for the OUT 23 command to select a specific range:

```
Bit 7 0 \ RAM mode
Bit 6 1 / enable
Bit 5 Disable write access (0)
      or allow (1)
Bit 4 \   Selection of the area
Bit 3  \  Selection of the area
Bit 2   | Selection of the area
Bit 1  /  Selection of the area
Bit 0 /   Selection of the area
```

Bits 4 to 0 are used to select the desired RAM area. Bit 5 can be used to control write access to the address range 0-16383 ($0000-$3FFF), a 0 corresponds to write protection and a 1 allows write access. The only firmware that uses RAM mode is ResiDOS:

- **OUT 23,BIN 01001000 (or OUT 23,72). Enables ResiDOS on area 8 with write protection**
- **OUT 23,BIN 01101000 (or OUT 23,104) Activate ResiDOS on area 8 without write protection**

ROM MODE (BIT 7 = 1, BIT 6 = 0)

In this mode, the DivIDE Plus uses only the ROM and divides it into 32 areas of 16kB each. These 16kB are completely mapped into the address range 0-16383 ($0000-$3FFF). An OUT 23 command can select a specific area with the following parameter:

```
Bit 7 . 1 \ ROM mode
Bit 6 . 0 / enable
Bit 5 . Disable write access (0)
        or allow (1)
Bit 4   \  Selection of the area
Bit 3    \ Selection of the area
Bit 2    | Selection of the range
Bit 1    / selection of range
Bit 0   /  Selection of the range
```

Also here the bits 4 to 0 determine the selection of the desired area. Bit 5 is also used here to control write access to the address range 0-16383 ($0000-$3FFF), where a 0 disables write access and a 1 permits access. However, accidental overwriting of the flash memory is not possible, since a special algorithm is required for this. Currently I don't know of any firmware that uses ROM mode.

RESET MODE (BIT 7 = 1, BIT 6 = 1)

This mode can be used to reset all internal memory bank registers of the DivIDE Plus:

```
Bit 7 1 \ Reset mode
Bit 6 1 / enable
Bit 5 0
Bit 4 0
Bit 3 0
Bit 2 0
Bit 1 0
Bit 0 0
```

This corresponds after decimal conversion
OUT 23,192
After sending this command, a reset should also be executed on the Spectrum. The reset mode is mainly intended to deactivate the MAPRAM mode of the DivIDE Plus. With the simple DivIDE, the power supply always had to be switched off for this, and this may also be necessary with the DivIDE Plus if the system can no longer be operated in MAPRAM mode.

INSTALLING A NEW FIRMWARE

If you want to install a firmware in the flash memory of the DivIDE Plus, then a flash utility is needed, which was written especially for the DivIDE Plus. This utility also takes into account the special feature that flash memories must be erased before programming. The chip 29F040 used here doesn't have to be erased completely, but only one of 8 sectors, each 64kB in size. However, such a sector always contains two firmwares. This means that when installing a new firmware, the neighboring firmware must always be reinstalled as well. Related to the delivery state of the DivIDE Plus, FATware and DEMFIR as well as +DivIDE and MDOS3 are in a common memory sector.
Unfortunately, this flash utility is hard to find as a download. The Czech DivIDE Plus homepage

[https://velesoft.speccy.cz/zx/divide/divide_plus/divide_plus.htm]

mentions the "Flash eprom programming utility", but it was probably never released. Some years ago I got a special version of ESXDOS 0.8.5 for the DivIDE Plus and this included the flash utility. From this package I took the BASIC part and the flash utility and combined them with the firmware files of ESXDOS and FATware. With this combination it is possible to install ESXDOS and FATware on the DivIDE Plus. This installation package can be downloaded from my homepage.

https://s-huehn.de/spectrum/software.htm#esxdos

Here you can also find a detailed description of the installation process.
Basically the installation works as follows: Via a PC the prepared TAP file (e.g. "esx88f12.tap" from my installation package) is copied to a CF card. This TAP file contains the flash utility as well as the two ROM files for the firmwares ESXDOS and FATware to be installed. As already mentioned, two firmwares are deleted when the dedicated memory sector has to be deleted. These have to be reinstalled one after the other via the flash utility. In the following description I will install ESXDOS as main system (OUT 23,0) and FATware as second system (OUT 23,2). By the way, no jumper has to be pulled or plugged on the DivIDE Plus during the whole procedure.
After starting the TAP file on the Spectrum (e.g. with the Disk Browser of FATware) one has the possibility to select one of the two firmwares with the "N" key, here the correct file "ESXDOS.BIN" was already loaded. Afterwards one starts the flash utility with ENTER. Here the Erase menu must be called first over the menu option "X" and the memory sector concerned must be deleted (sector 0). After returning to the main menu, the program menu is accessed by selecting the menu option "W". Here one selects the desired memory sector into which the new firmware file is to be written (Page 1). At this point it is no longer possible to return to BASIC and the Spectrum should be switched off. The CF card now comes again into the PC and here the necessary files for ESXDOS are copied to the CF card (directories /bin, /sys and /tmp).
The CF card is again inserted into the DivIDE Plus and the Spectrum is switched on while holding down the space bar. If everything works, then the freshley installed ESXDOS should show the typical startup screen and thus confirm the installation success. To install the second firmware, the TAP file is now started again (e.g. via the NMI menu of ESXDOS). Now the firmware "FATware12a" can be loaded here via the "N" key and the flash utility can be started again with ENTER. The Erase menu is not needed for this step and "W" takes you directly to the program menu. The second firmware is now written into the designated memory area (RAM page 3). If the second firmware needs additional files, then the CF card must be inserted into the PC again. In the case of "FATware12a", however, this is not necessary. This completes the installation.
One more hint: A firmware installation is always connected with a certain risk. If you renew the main firmware (as just described), then you are literally sawing at the branch on which you are sitting. Critical is the moment after deleting memory sector 0. If the power is switched off at this point or the Spectrum crashes, then booting is no longer possible. In such a case, you first have to deactivate the DivIDE Plus by pulling a jumper on the back and then start a revival attempt with the help of a good old cassette. If approached carefully, a firmware installation goes through without a hitch and my DivIDE Plus has survived this procedure several times.

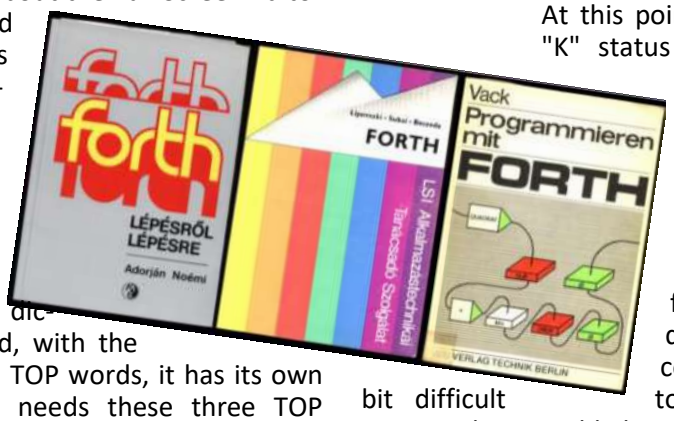
CONCLUSION

The DivIDE Plus is a dedicated storage solution for all model variants of the ZX Spectrum. Although it is relatively exotic and better alternatives are now available, I love using it. It is still the only device that can manage multiple firmwares at the same time and easily switch them via an OUT command. So you are not tied to one firmware and can move in multiple worlds.
By the way, on my DivIDE Plus I use ESXDOS as the main system. Occasionally FATware is used as a fast program launcher because of its support for long filenames. With +DivIDE I manage more than 80 virtual floppy disks, which I took over from earlier times of Plus-D floppy disks. From time to time a special feature of ResiDOS is needed: It is the only firmware that can read and write TZX files.
Scott-Falk Hühn (s.huehn@soemtron.de)

»ARCUS FORTH«- PART 2

BY HARALD LACK

Hello Arcus-Forth fans and all those who want to become fans!
Today we are going to talk about the Full Screen Editor of Arcus FORTH - as I told you in part 1 - which means that we have learned everything we need to know to use this programming system and can theoretically start programming in Forth. The Full Screen Editor (FSE) - as it is called - is already included in the dictionary of Arcus FORTH and, with the exception of three so-called TOP words, it has its own vocabulary. The user only needs these three TOP words which are as follows:



CLEAR (N >)

Clears/sets screen no. n to empty and writes it back to the internal RAM disk. You remember, this is the part inside the memory that is 16 K in size and contains all 32 screens. The content of screen n is overwritten (so to speak with nothing) and is then empty respectively lost in content. This means that it is better to think carefully about how to use this command.

COPY (N1 N2 >)

Copies the content of screen n1 to screen n2 and writes the new version of screen n2 back to the RAM disk. The old content of screen n2 is lost. This is similar to CLEAR. So far so good. But now it really (finally?) goes to the program input or program code.

EDIT (N >)

Starts the editor for editing screen n and possibly other screens. After starting the editor the screen looks like this (example borrowed from Michael Balig's documentation):

```
Bildschirm        Inhalt
zeile
00    arcus Full Screen Editor        #
01    SCR * 19                         ¬
02    (Beispiel f. Editor, Wort S)
03
04      : . S CR ." = STACK ="
05          SP$ S0 $ =
06          IF    ."    ...leer."
07          10 SPACES
08    ELSE
09    SP$ 2 - S0 $ 2
10    DO CR
11          1 SP$   2 / 7 .R
12          1 $ 6 .R
13           2 +LOOP
14          17 SPACES
15    ENDIF ;
16
17
18                    -              ¬
19
20    line stack:
21    ??????????????????????????????
```

The # sign in screen line 00 on the far right represents the blinking cursor, which indicates the current keyboard status as we already know it from the Spectrum. At this point it may be noted that the "K" status (keyword) cannot logically exist, since Forth does not use TOKENS. This character has no other functions. The actual cursor is a bright marker at the leftmost edge of line 2. In Arcus FORTH it is a non-flashing cursor. Therefore it is always visible even during fast movements. Of course, this means that it is a bit difficult to find at the beginning, because it does not blink and we are used to this from a cursor. From this line 2 the display of the actual screen content begins (here we are dealing with screen no. 19 as an example). With the cursor keys, which we know very well, we can move the cursor to any place on this screen and enter an alphanumeric character there. Anything that was previously at this position will be overwritten without mercy, i.e. the previous text will not be moved to the right. However, this input is only done on the screen and therefore on the disk buffer, not on the RAM¬ disk as some of you might have expected. There are only finished screens, i.e. screens that are no longer being processed. The input is done under the same conditions as in BASIC mode. All special characters can be reached according to their positioning on the keyboard (by pressing one or more function keys). As an example, "\" is reached by the combination "EXTENDED MODE - SYMBOL SHIFT - D". Some of the BASIC keywords perform special tasks. However, we should keep in mind that they cannot be entered as tokens, since this is intended exclusively for the BASIC interpreter. Characters can simply be overwritten on the screen. There are also a number of functions in FSE that we will now briefly look at/get to know:

GROUP C /CHARACTER <>

Insert space. The rest of the line then moves one place to the right, which means that the penultimate character is lost, but the last character is retained. In the program text it is essential to note that this last character should not be occupied anyway, except with a closing comment bracket and this must be retained.

GROUP C / CHARACTER DELETE

The character at the current cursor position is removed. The rest of the line moves up one position from the left. A space is inserted on the far left as a result.

GROUP C / CHARACTER >=

Tabulation. The cursor moves in the direction of the ascending position, i.e. to the right to the next position divisible by 8 without a remainder. The position of the tabs cannot be changed and is fixed to every 8th posi-

tion. With 32 characters in one line this makes not only mathematical sense.

GROUP C /CHARACTER =<

The opposite of the previous >= command, namely the backward tablature, the same applies as said under >=. That means it goes to the left to the next position divisible by 8 without remainder.

GROUP C / CHARACTER MOVE

The cursor moves to the upper left corner of the screen. This is position 0 on the screen (see also "EXTENDED MODE - SYMBOL SHIFT - 6").

GROUP C / ENTER CHARACTER

The cursor moves to the beginning of the following line. Quite normal, as in other editors.
Group Z / character TRUE VIDEO
From the current cursor position (taking it into account) 32 characters are removed in ascending direction (i.e. to the right). At the end of the screen (not of the line!!) 32 spaces are inserted for it. If the cursor is at the beginning of a line, then exactly this line will be removed because of the line length of 32 characters.

GROUP Z / CHARACTER INV VIDEO

From the cursor position (inclusive) 32 spaces are inserted. The last line of the screen is thus lost. If the cursor is at the beginning of a line, this means that exactly one line will be inserted from here. This is empty at the moment, but can of course still be filled with input.

GROUP Z / CHARACTER OR

The line in which the cursor is currently located is copied to a clipboard. This is analogous to the clipboard in DOS. The content of the buffer (line stack) is displayed informatively for the user in screen cell 21. If there are only question marks there is nothing in the buffer at the moment (initial state).

GROUP Z / CHARACTER AND

The line currently in the line stack (contents see line 21) is copied to the position/line where the cursor is currently located. The current content of this line is deleted and lost.

GROUP S / CHARACTER STOP

This is the command to exit the editor. The displayed (and often changed compared to the RAM disk) content is written to the RAM disk. This marks it as valid in the system.

GROUP S / CHARACTER NOT

The editor is exited without saving the displayed screen contents to the RAM disk. Be careful: The changes you made, are lost.

GROUP S / CHARACTER TO

All changes made to the currently displayed screen after the last write-back to the RAM disk are undone. Can sometimes be very useful if you want to fix logical errors and return to an orderly (known) state of the screen.

GROUP S / CHARACTER STEP

The current screen content is written to the RAM disk and the previous one is released for editing.

GROUP S / CHARACTER THEN

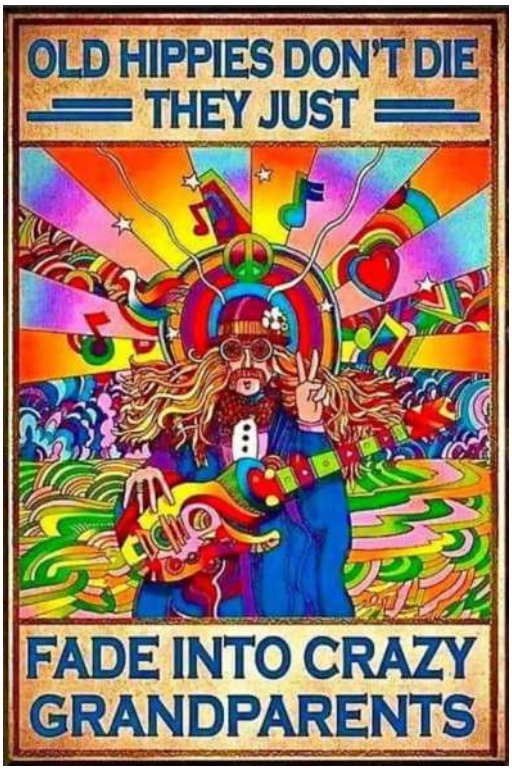
The currently displayed screen is written to the RAM disk and the following screen is released for editing.

GROUP S / CHARACTER AT

The currently displayed screen is copied to the next numerically following screen. This and the next following screens are shifted backwards by one screen each. The last screen (correct: this is number 31) is inevitably lost. Such far-reaching operations should therefore always be considered carefully, because a screen that might have been needed is quickly lost.

GROUP S / CHARACTER ERASE

The displayed screen is erased from the screen and the RAM disk to empty. (EXTENDED MODE - SYMBOL SHIFT - 7)
ATTENTION!!! This function is executed immediately and cannot be stopped.
So much from my side about the operation of the editor of Arcus Forth. As you can see, the handling itself is no witchcraft. You just have to get used to which keys are needed for which actions. I hope I could draw the attention of one or the other to this quite interesting programming language implementation. Theoretically we now have the tools to work with Arcus Forth. Now we "only" have to deal with Forth itself. Maybe one or the other of you has already made experiences with this programming language, which he would like to share with us other users? It would also be interesting if one of us would like to try a beginner's course for Forth. We have now learned about a possible operating technique using Arcus Forth.
In this sense - happy computing!



ALSTRAD (AL-STRAD) ADVENTURE SOLUTION

FROM HARALD LACK

Dear friends of the cultivated adventure!
It has been said that programs were first released on other popular computers before they saw the light of day on our Sinclair ZX Spectrum. One such example is the actual adventure Alstrad, which was programmed and published by Paul Gill in 1991 on the Amstrad before it was adapted for the ZX Spectrum by The Guild and published by Pegasus Software. But we don't want to be vindictive. The program for the Spectrum 48K can be operated relatively smoothly and also otherwise it is an adventure game that demands all kinds of puzzling. It is not even disproportionately extensive, I only visited 54 locations for my solution. So everything is quite normal for adventures on the Spectrum. As you are used to from my solutions, first a short background story about the plot, so we know what it's all about.
The story takes place in a fictional kingdom named Megabyte, which is ruled by a friendly king named Kilobyte. He has a daughter who is supposed to be beautiful (or so we hear) and she is kidnapped by the villain Sink. The player now embodies a certain Al-Strad who is either particularly brave or particularly stupid, because he takes on the task (for which a nice chunk of money is offered) of freeing the beautiful princess Sally Software and stopping the evil Sink cold. From the name alone, it's easy to make a reference to computers - but this is just a side note. Like many adventure games, this one also has some peculiarities, because there are some undefined directions in it that result from commands like SWIM, JUMP or FLY. I have therefore included these so to speak "random" directions in my plan for these locations and drawn them in this way. Of course, this has no relevance for the plot. In addition, we occasionally get objects without having to take them, while others are objectively visible and have to be taken. The reason for this is only known by the program author. So much for the short introduction. But now back to the location descriptions and the findable items (as far as they are concerning my solution):

1. In a forest clearing
2. Climbed up a hill / axe
3. Stood beside a huge oak tree
4. In the top of the huge oak / spade
5. Inside the huge oak / pair of armbands
6. Beside a fast flowing brown coloured river
7. On a beach of a small deserted isle / coconut, tall palm tree, banana
8. Through a forest on a clearing /crocodile
9. In another forest clearing / large and vicious looking dog
10. In a small cave
11. Inside a small hut / safe, lever, red powerpill
12. In a dark dank room / large locked door
13. In the corner of an East-South corridor
14. In a corridor
15. In the adductive room / wax model of Kev Tons, electric torch, pile of magazines, amulet
16. In a Puck-Mans maze A
17. In a Puck-Mans maze B
18. In a Puck-Mans maze C
19. In a Puck-Mans maze D
20. Beside Puck-Mans maze / strange machine
21. In the computer games hall of fame / lots of pictures, shiny key
22. Beside a rubbish chute / rubbish chute, new penny
23. At the bottom of a smelly rubbish chute / steel rod
24. In a Puck-Mans maze E
25. In a Puck-Mans maze F
26. In a room stinking of rubbish / pile of rubbish, needle, shiny key
27. Room with an impatient monkey / monkey, credit card in cage
28. In a small secret room / stick of dynamite, glistening mirror
29. In what appears to be a shop / small shopkeeper, bridge game, astro-smash game, puck-man game
30. Beside a huge chasm
31. At the bottom of a huge chasm / some batteries
32. On the far side / glass case, footy tape
33. In a corridor which to the east gets very dark and spooky
34. At the end of the corridor
35. In a scruffy room / scruffy clothes, wooden table
36. In a toilet / toilet
37. Standing outside a large door / mumbling bouncer
38. In a high up bedroom / cupboard, bed
39. At the far end of the bedroom / empty fuel can
40. Inside a cupboard / lots of coats
41. Beside a cupboard in the lost land of lazy programmers
42. In a large deserted plain / sword in a stone
43. On the far side on a pool of quicksand / angry looking brute, strange coin
44. In the entrance to a large cavern / laser gun
45. On a staircase which winds it way down
46. In a dusty chamber / rotting skeleton, hieroglyphics scraped on the wall, bones
47. Inside the rocket / spacesuit, button
48. In the engine room / fuel cap
49. Upon the moons surface / shiny rocket, lots of martians
50. On the moons surface by a crater / large crater

51. Halfway down a large crater / some large rox
52. In the martians pub / juke box
53. Inside a tiny hidden cubby hole / small hammer
54. In a small dark chamber / princess Sally, Sink

So much for the location descriptions of the plan including the items available there (some useful, others rather less). More about this in the course of the step-by-step solution.
Then we can already start with our mission to save the princess...

INVENTORY (nothing to it but our hunger), UP, TAKE AXE, DOWN, N, UP, TAKE SPADE, DOWN, IN, TAKE ARMBANDS, HELP (to inflate), OUT, S, BLOW ARMBANDS, EXAMINE ARMBANDS (great for swimming), WEAR ARMBANDS, EXAMINE FISH (we have hiccups), WAIT, WAIT, WAIT (until the letter twisting calms down), SWIM, TAKE COCONUT, EXAMINE COCONUT, BREAK COCONUT, EAT COCONUT, DROP SHELLS, HELP (we remember the spade), DIG (we find a banana - usually grows on trees), EXAMINE TREE (there is a combination lock in the bark), DROP SPADE, S (we ignore the crocodile as a precaution), JUMP (we see a vicious dog), N, IN (translated this is >to cross the quicksand), HELP (with a clever throw you can build a bridge here), OUT, N, SWIM, N, IN, OPEN SAFE (we find a pill), EXAMINE PILL (protective), PULL LEVER (we fall into a dark room), EXAMINE DOOR (firmly locked), BREAK DOOR, DROP AXE, S, S, S, HELP (there's Kev the ego-Kevin and author of Footy), EAT PILL, S, S, S, E, HELP (take a closer look), EXAMINE MACHINE (a slot for cards), S, EXAMINE PICTURES (we get a key), S, DOWN, TAKE ROD, UP, N, N, W, W, N, N, N, UNLOCK DOOR, DROP KEY, W, HELP (not all trash is worthless), EXAMINE RUBBISH (we find a needle), TAKE RUBBISH, S (there's a monkey and a credit card in the cage), GIVE BANANA, TAKE CARD, N, E, S, S, S, S, E, INSERT CARD (it clicks. ..), E, TAKE DYNAMITE, W, S, S, INSERT RUBBISH, TAKE PENNY, S, HELP (get your money ready), GIVE PENNY (we get to choose one of three games), Go N, N, N, W, W, N, N, DROP DYNAMITE (there's a hole in the wall), E, HELP (tide Grib - properly sorted that means bridge it), DOWN, TAKE BATTERIES, UP, W, S, S, S, E, S, S, S, TAKE BRIDGE, N, N, N, W, W, N, N, E, DROP BRIDGE, E, EXAMINE CASE, BREAK CASE, TAKE TAPE, EXAMINE TAPE (from Kev Tons), DROP ROD, W, W, GIVE TAPE (Kevin melts and we get a torch), EXAMINE TORCH (no batteries in it), INSERT BATTERIES (and it lights up), EXAMINE MODEL (we discover an amulet), TAKE AMULET, EXAMINE AMULET (gives powers like stone, but you mustn't wear it too long), N, N, E, E, N, TAKE CLOTH, EXAMINE CLOTH (need some repair), FIX CLOTH, EXAMINE CLOTH (magic, what else), DROP NEEDLE, S, S, PULL CHAIN (removes the force field in the bedroom), N, E (we see a strange fellow saying >space rox), HELP (we do as he says), W, W, S, FLY, E, TAKE CAN, W, IN (ignore coats), N, N (if this isn't some kind of Excalibur), TAKE SWORD (doesn't work yet), WEAR AMULET, TAKE SWORD, REMOVE AMULET, DROP AMULET, S, S, OUT, FLY, S, S, S, S, E, E, TAKE MIRROR (back in the clearing), Go S, SWIM, S, FLY (we see a beast), FLY, THROW SWORD (flies over quicksand), FLY (the beast is done for), EXAMINE BRUTE (we find a coin), IN (we don't need the laser rifle), HELP (with power), PUSH ROCK (now we can get down here), DOWN, DOWN, READ HIEROGLYPHICS (the address of Pegasus Software - a bit of advertising is necessary), EXAMINE SKELETON (lots of old bones), TAKE SKELETON, HIT SKELETON (it's falling apart and we're taking the bones with us), UP, UP, OUT, FLY, JUMP (there's the dog from before), GIVE BONE (he's fleeing), IN, DOWN, EXAMINE CAP, HELP (the fuel gave us our hiccups - you're not supposed to breathe it all in), UP, OUT, N, N, SWIM, FILL CAN, SWIM, S, JUMP, IN, TAKE SPACESUIT, WEAR SPACESUIT, DOWN, FILL CAP, DROP CAN, UP, EXAMINE BUTTON (start button), PRESS BUTTON, OUT (we are on the moon - the Martians are ignored), Go E, DOWN, EXAMINE ROX (too big to be moved), DOWN, HELP (we are listening), EXAMINE JUKEBOX (you can put coins in here), INSERT COIN, (there's a secret room heading north), N, TAKE HAMMER, S, UP, HIT ROX, LOOK (all crushed), DROP HAMMER, TAKE ROX, UP, W, IN, PRESS BUTTON, REMOVE SUIT, DROP SUIT, OUT, N, N, SWIM, N, IN, PULL LEVER, S, E, E, GIVE ROX, E (we see Princess Sally and the evil Sink. We jump on him and he explodes. Sally is ours. End of the adventure. Score: 90/90.
Finally, a brilliant finish, we can sit back and enjoy our success.

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»NEXT« QUICK START GUIDE

BY CHRISTOF ODENTHAL

1. OVERVIEW

With this article I want to help you to get started with the ZX SPECTRUM NEXT. It should give you an overview of its capabilities, answer the most basic questions and make you a little curious about its special abilities.
The ZX SPECTRUM NEXT was available in 2017 on the crowdfunding platform www.kickstarter.com in the following expansion stages: "NEXT" (basic expansion), "NEXT PLUS" (with real-time clock and Wi-Fi module) and "NEXT ACCELERATED" (real-time clock, Wi-Fi module and Raspberry Pi Zero Accelerator). I will go into more detail about the expansion stages below.
The NEXT can emulate (impersonate) various computers and not just from Sinclair, there is a constantly growing list of systems! In the following, these are called "personalities". But the Next also has its own personality based on the ZX Spectrum +3e (Amstrad +3 with error correction and mass storage support) and ResiDOS (can run completely in RAM) and also contains many functions of esxDOS. The Next Basic is the same as the 128 Spectrum Basic with some error corrections

and extensions to make the new functions easy to use. But there is also a 48 mode.
Now you may ask yourself how the NEXT (apart from the new functions) differs from the many emulators known from the PC, for example? Well, the NEXT is based on a so-called "FPGA" (Field Programmable Gate Array) - a logic component that can be programmed "in the field", i.e. at the customer's site (in the installed state). In contrast to a component that is "hard-wired" during production, such as the Z80 processor or the ULA in the Spectrum, the FPGA contains, in simplified terms, a collection of logic circuits, memory and a kind of plug-in board with which these can be more or less arbitrarily reconnected at any time. This means that, theoretically, any circuit can be realised with an FPGA! In the case of the NEXT, parts of the real home computer (including the processor and the video chip) are reproduced in hardware instead of in software, as would be the case with an emulation! The advantages are the more exact reproduction of the respective computer and that the NEXT is perhaps closer to the real computer system in terms of feel.

1.1 SOME TECHNICAL TERMS

Before we start, I would like to explain a few more terms. The NEXT emulates the following computer components, among others: A DMA, a Copper and a UART. These special components are used to relieve the main processor of special tasks. By specialising, they do their work much faster or allow the processor to do other work at the same time. "DMA" stands for "Direct Memory Access". This component moves large blocks in the memory much faster. The "copper" (short for "co-processor") is a "raster line processor" - it can perform special functions when displaying the video image, such as changing the colour palette after a certain pixel line so that the computer can display even more colours at the same time (in different lines). This way, the main processor does not have to wait itself until the image display of the respective pixel line begins. The UART ("Universal Asynchronous Receiver Transmitter") is used for serial data transmission, as it is also realised, for example, in Sinclair's Interface 1 (in a more primitive form). Here, too, the main processor does not have to collect or send the individual transmitted data bits itself and wait for them in the pauses (as is the case with Interface 1, this is called "bit banging").
As a Spectrum user, you may not be familiar with the term "sprites". Sprites are small moving images (mostly used in games for figures and projectiles, but they can also be a mouse arrow in an application). The special thing about them is that they are generated via the hardware and mixed together with the video image, so they are not part of the normal screen memory and do not destroy its contents (that's a fine thing!). There is also collision detection between the sprites themselves or the background (from screen memory). However, they have limitations in their number (how many can be displayed side by side at the same time) and in the size and amount of colours that can be displayed at the same time. The term "shapes" was once coined to distinguish them from "software sprites" (as used in the Spectrum), which are created by overwriting software in the screen memory, but it has probably not caught on and is therefore not very common. Sprites have been around for quite a long time, not just since the Commodore 64. The Atari VCS 2600 (and subsequent Atari computers) already had so-called "player missile graphics".
The esxDOS (short for "Enhanced Speccy eXperience") is a very versatile operating system for the DivIDE, DivMMC, DivMMC EnJoy! and the MB03+ (and now of course the NEXT) disk interfaces.
Let's move on to the Raspberry Pi, which is available as an "Accelerator" option to the Next (in the "Zero" variant). The Raspberry Pi came onto the market in 2012 as a small, inexpensive learning and experimental computer for schoolchildren, usually sold without a case, and has since experienced an enormous surge in popularity. It can be used as a full-fledged computer with a graphical user interface, keyboard and mouse, or simply as a control computer without any of that. The recommended operating system "Raspberry Pi OS" is based on Debian Linux, but there are also numerous others. There are now also numerous variants of the Pi, although the "Zero" used in Next is probably the smallest, which comes with some limitations.

1.2 CAPABILITIES IN THE BASIC CONFIGURATION

Here is a small overview of the capabilities of the ZX SPECTRUM NEXT:

- Processor: Z80N (replica of the Zilog Z80 in hardware with additional instructions)
- Processor speeds: 3.5 MHz, 7 MHz, 14 MHz and 28 MHz (changeable during operation)
- 1024 kB RAM, in memory blocks of 16 kB each (768 kB free, expandable up to 2048 kB)
- 64 kB ROM (four ROMs with 16 kB each)
- Video output: two analogue (RGB, VGA), one digital (HDMI)
- Video resolutions: 128x96, 256x192, 512x192, 640x256 pixels
- Colours: 16 to 256 simultaneously from a palette of 512 colours
- Support for the "ULAplus" video chip (palette with 260 colours, 32 or 64 simultaneously instead of Bright and Flash, maximum 256 simultaneously)
- Up to 128 hardware sprites in 16x16 pixel size with 16 or 256 colours. Additional functions: Magnification 2x, 4x, 8x, mirror, rotate, overlap on border
- Sound output via frequency modulation: "TurboSound" emulation (three of the 128 Spectrum sound chips "AY-3-8912", i.e. nine sound channels)
- Sound output via amplitude modulation: "SpecDrum" emulation - one 8-bit digital-to-analogue converter (DAC), "Covox" (two DAC's, stereo), "SounDrive" (four 8-bit DAC's, stereo)
- Operating system NextZXOS, NextBASIC, optional CP/M
- Mass storage: SD card slot (supports SDHC cards, but probably not SDXC), DivMMC (esxDos) compatible

- Two joystick ports (adjustable to cursor, Kempston, Sinclair emulation)
- Support for PS/2 keyboard and mouse (Kempston compatible)
- Support / ports for real cassettes (load/save)
- Original ZX Spectrum Expansion Port
- Multiface simulation (not for Next software)
- Other features: Hardware scrolling, DMA (memory block shifter), Copper (raster line processor), UART (serial port).

1.3 CAPABILITIES IN THE EXPANSION STAGES

As mentioned above, the NEXT was also available in the expansion stages "NEXT PLUS" (with real-time clock and Wi-Fi module) and "NEXT AcCelerated" (real-time clock, Wi-Fi module and Raspberry Pi Zero Accelerator), but these components can also be upgraded. Here are a few details:

- Raspberry Pi Zero Accelerator (1 GHz CPU, 512 MB RAM) - e.g. for loading TZX files, playing music (mp3, SID emulation, Atari ST, Amiga), as a second screen for games / programmes on the Spectrum.
- Wi-Fi module (ESP8266) - access to a wireless network / internet
- RTC module / real-time clock (DS-1307) - battery-buffered, for displaying date and time (files are also provided with date when saved)
- Internal loudspeaker can be retrofitted
- The NEXT talks to the Wi-Fi module and the Raspberry Pi Zero via the UART chip. The sound output from the Raspberry Pi can be connected to the mixer in the Next so that it can also contribute to the sound output. It can also be connected to the sound input of the Next to play TZX files (as a cassette simulator).

1.4 PRE-INSTALLED COMPUTER SYSTEMS »»PERSONALITIES««

By default, NEXT can emulate the following systems, but there are others (also under development) that can be installed additionally (see below):

- ZX SPECTRUM NEXT (standard)
- ZX SPECTRUM NEXT (LG 48K ROM)
- ZX Spectrum 48K
- ZX Spectrum 128K
- ZX Spectrum +2
- ZX Spectrum +2A/+3 (with bugfixes by Paul Farrow)
- ZX Spectrum +3e (Garry Lancaster)
- ZX80 Emulator (Paul Farrow)
- ZX81 Emulator (Paul Farrow)
- 48K Gosh Wonderful ROM v1.33 (Geoff Wearmouth)
- 48K Looking Glass ROM v1.07 (Geoff Wearmouth)
- 48K Looking Glass ROM v1.07-al (Geoff Wearmouth)
- Timex Sinclair TC2048
- Investronica Spectrum 128K
- Soviet Timings (128k) / Pentagon

Note: Only the NEXT Personalities have a mass storage support (ROM) installed by default, for the other emulations you have to set it up yourself (see below in the software chapter).

1.4.1 ZX SPECTRUM NEXT

- The ZX SPECTRUM NEXT contains all the new features like the extended instruction set for the Z80 processor, the new video modes, sound, sprites, DMA, Copper, etc.
- The NEXT (LG 48K ROM) contains for the 48 mode the Looking Glass ROM with the input of commands as single characters.
- The NEXTZXOS contains an esxDOS compatibility layer and does not need the original esxDOS (if you want to use the original esxDOS, you need version v.0.8.6beta or newer)
- MF ROM (Multiface replica)

1.4.2 ZX SPECTRUM +3E

- Based on the +3 ROM from Amstrad
- Supports all known hard disk, Compact Flash, SD, MMC interfaces
- Extended +3 BASIC (e.g. for disk handling, text window)
- Compatible with +3DOS software
- Contains many corrections to known errors in the original ROM
- Loading of .Z80/.SNA files with SPECTRUM command

1.4.3 ZX80 / ZX81 EMULATOR

This is not a "real" ZX80 or ZX81 with hardware simulation like the Spectrum's, but based on a ZX Spectrum 128K with software emulation via modified ROMs by Paul Farrow. It is possible to load games from cartridge and many of them should run, including some high resolution ones. The keyboard of the ZX80/81 has been adapted to that of the 128 to make it easier to find the keywords.

When you start the emulator you have the choice between different RAM memory configurations (1K, 4K, 16K and 32K for the ZX81), a tape loader and a copy menu to transfer programs over different interfaces.

In Jungsi's Corner there is a very good description of the emulator (in German):

https://www.jungsi.de/retro-sinclair-zx-spectrum-zxc3-part-3/

There is also a similarly constructed Jupiter Ace emulation by Paul Farrow (not pre-installed).

1.4.4 GOSH WONDERFUL ROM

- Based on and compatible with the original 16K / 48K Spectrum ROM
- Compatible with ZX Printer, ZX Net, Interface 1, ResiDOS, Plus D, Disciple (not compatible with Opus Discovery!)
- Contains many corrections to known errors in the original ROM
- Tokenizer: BASIC commands are entered character by character (the input method can be switched by "STOP" from the input line)
- As before, "Extended Mode" for entering some tokens and symbols
- Extended BASIC (via REM commands from the input line - just type REM for help): Renumber, Block Delete and Stream List (memory/stream info).

- BASIC command names should not be used for variables

1.4.5 LOOKING GLASS ROM

- Successor of the Gosh Wonderful ROM (compatible to the original ROM)
- As before with various bug fixes
- Tokenizer: BASIC commands are entered character by character (the input method can be switched by "STOP" from the input line)
- With improved keyboard input compared to the Gosh Wonderful ROM
- Symbol Shift for direct input of red symbols (with changes to Q, W, E, I, P, F, G - see keyboard help with "REM k")
- Extended Mode" only for colour input
- With keyboard help and Streams Map (just enter REM from the input line for help)
- Without Renumber and Block Delete
- ROM version "-al" with alternative font

1.4.6 TIMEX SINCLAIR TC2048

- Compatible with ZX Spectrum 48K (not 100% due to differences in ROM)
- Developed by Timex Portugal with Kempston joystick and additional video modes
- Additional resolutions: 256x192 with 32x192 attributes and 512x192 in black and white
- 80 characters text mode
- Two interchangeable screens or one large screen (located directly behind each other in memory)

1.4.7 INVESTRONICA SPECTRUM 128K

- Developed by the Spanish company Investrónica
- ROM with Spanish texts (not fully compatible)
- Different timing (no memory slowed down by ULA)
- 1.4.8 Soviet Timings (128K)
- Pentagon & Co.
- Same ROM as ZX Spectrum 128K
- Only 48 Hz video (possibly problems because no 50 Hz). No 60 Hz
- With Turbo Mode (7 MHz)
- Different timing (among other things, no memory slowed down by the ULA)
- - 512 K RAM mode

2. HARDWARE

2.1 INTERFACES

- 9V power supply (centre plus, outside minus, 2.1 Ampere - Attention NOT compatible to old Spectrum power supplies!)
- Connection for cassette recorder (EAR/MIC)
- Audio Out
- HDMI - Attention: The NEXT may also be supplied with power via HDMI! In case of problems with the cold start or if you want to change the SD card, it is better to remove the HDMI plug as well as the power!
- VGA/RGB (RGB via special SCART cable)
- Two joystick ports (adjustable to Cursor, Kempston, Sinclair)
- PS/2 port (external keyboard and Kempston mouse)
- ZX Spectrum compatible expansion bus
- Raspberry Pi Zero: digital video debug, two micro-USB ports (note - the right micro-USB is only for powering the Pi!)
- SD card slot (SD card a bit difficult to remove, as there is no eject spring)

2.2 BUTTONS AND FUNCTION KEYS

- - Reset button (short press < 1 second = soft reset / longer = hard reset)
- - Drive button (with Caps Shift, drives are re-read and esxDOS is reloaded - only works with original esxDOS, no function with NextOS so far!)
- - NMI button (short press < 1 second = Multiface / longer together with number key = function keys, see below)
- - NMI together with Drive button activates the "anti-brick" mode (in case of a firmware update gone wrong).

With the NEXTs that come in the original case, the PS/2 keyboard must be activated in the boot menu (this is a keyboard↔mouse switch, default is mouse), with the Next's that were only available as a mainboard, the PS/2 keyboard is standard. The setting applies to all Personalities. To do this, press SPACE after switching on, select any personality with the cursor keys and press "E" to display the options. There is an entry "PS2" which you can also select with the cursor keys and switch with SPACE. Press ENTER to accept the selection. By the way, I have successfully connected a USB keyboard via a USB-PS/2 adapter.
The function keys of the PS/2 keyboard have the following assignment (but you can also activate the function via NMI button + number key directly on the Next):

1. F1 = Hard Reset (with selection of Personality)
2. F2 = Scan Doubler (to display an RGB video image on a VGA monitor)
3. on a VGA monitor)
4. F3 = Change 50/60 Hz video (PAL, NTSC)
5. F4 = Soft Reset
6. F5 = (no function)
7. F6 = (Without function)
8. F7 = Switch through scanline effect: 0%, 25%, 50%,
9. 75% - Simulates tube screen
10. F8 = Turbo mode for processor (3.5 MHz, 7, 14, 28)
11. F9 = NMI (Multiface)
12. F10 = divMMC Drive button (with Caps Shift
13. re-reading of the drives, with NextOS so far
14. without function!)

Note: Switching the CPU speed with F8 or NMI + 8 only works when the BASIC programme is running, not in input mode and not in the "Edit" menu. In input mode and while the programme is running, you can change the speed with the command
"RUN AT n" (n = 0 ... 3 for 3.5, 7, 14 or 28 MHz) and in the "Edit" menu simply by using the cursor keys left +

right. (For more information, see the article "NEXT-Basix" jg).

2.3 VIDEO MODES

These are all video modes of the NEXT, which are used with different personalities. In addition, the Next supports the ULAplus mode (palette with 260 colours, 32 or 64 simultaneously instead of Bright and Flash, maximum 256 simultaneously).

- 128x96 pixels at 4 bit (16 colours)
- 128x96 pixels at 8 bit (256 colours)
- 256x192 pixels with 32x24 attributes
- 256x192 pixels with 32x192 attributes
- 256x192 pixels at 8 bit (256 colours)
- 320x256 pixels at 8 bit (256 colours)
- 512x192 pixels (black and white)
- 640x256 pixels at 4 bit (16 colours)

3 SOFTWARE

3.1 SD CARD WITH THE NEXT DISTRIBUTION

With the NEXT comes a ready-made micro SD card, which is inserted in an SD card adapter. However, it makes sense to update it (it might also have new firmware). You can find out the version of the distribution on the SD card by opening the file "README.MD" in the main directory. The line with "System/NEXT" contains the version number. There are also other numbers for the NextZXOS, the core and the firmware.
The latest distribution is available here:

https://www.specnext.com/latestdistro

If you have not yet saved your own data on the SD card, you can simply reformat it and copy the new distribution onto it. The NEXT supports the two file formats FAT16 and FAT32. Windows seems to format SDHC cards only up to 32 GB (FAT32), with other programmes more is possible. It seems that 128 GB cards have also been used successfully in NEXT, but it is questionable how much sense this makes with the usual file sizes of the Spectrum... SDXC cards are not supported. For compatibility reasons, the following programme is recommended by the SD Association for formatting:

https://www.sdcard.org/downloads/formatter/

With the first generation NEXT, the SD card is a bit difficult to remove because the card slot has no ejector spring. There are plans to improve this in the second generation. The SD card slot is on the left side. I recommend using tweezers to pull the card out, gripping the edge (on the adapter).
You can make a pull-out aid with a strip of adhesive tape - just cut a four cm long piece, fold one cm of it over (adhesive side to adhesive side) so that the total length is perhaps three cm (two of them with the remaining adhesive surface) and then stick it on the underside of the SD card adapter (where the contacts are) so that the folded-over side protrudes as a handle and the contacts are not covered.
The downloaded distribution (e.g. "sn-complete-v.1.3.2.zip" - a ZIP archive) must be unpacked (Windows: double click) and its complete contents copied to the SD card so that e.g. the file "TBBLUE.FW" is in the root directory. The card is then prepared and can be inserted into the NEXT again.

3.2 STARTING THE SYSTEM

When starting the NEXT, you have a few seconds to press one of the following keys:

- SPACE = Menu
  (Select one of the pre-installed emulations)
- C = Additional Personalities
  (start additionally installed emulations)
- A = Overview of all video modes
  (select with Enter)
- D = Switch through HDMI (digital video) modes
- V = Switch through VGA modes
- R = Switch RGB modes

It is recommended to select the video mode directly from the keyboard instead of waiting for the test pattern. For each video mode there are several variants (50/60 Hz, Scandoubler, different timing) which can be switched through with the "N" key and confirmed with "Enter".
If there is a firmware update, a screen now appears with a note about the update. The update can be started by pressing and holding the "U" key (a prompt then appears which must be confirmed with "Y"). When the update is complete, a message will appear telling you that you may now switch off the NEXT (note that this may take a while, do not disconnect it from the power supply beforehand). When the update is finished, you should remove not only the power cable but also the HDMI cable, because it may also supply the Next with power!
In the "SPACE" menu, you can select one of the pre-installed personalities using the cursor keys up/down and either make settings for the personality with "E" or select it with ENTER and return to the main menu. Both the selected personality and the settings are saved and selected again the next time the system is started.
If the ZX SPECTRUM NEXT is selected as the Personality at start-up, a file called "autoexec.bas" in the folder "c:/nextzxos/" is automatically searched for and, if present, executed. You can insert your own initialisations there or start a programme automatically.
If you only want to open a certain file after starting, you don't have to go into Basic and type in tedious commands to load it - with the file browser it's much easier and faster! It knows many file formats and how to open them correctly.

3.3 SETTING UP ESXDOS ON THE SD CARD

I recommend to install the original esxDOS for MMC directly to be able to use it in the other personalities (like 48K Speccy or 128s). You can download the latest distribution here:

http://www.esxdos.org/index.html.

For the NEXT it should be at least version v.0.8.6beta or newer. From the zip archive (e.g. "esxdos089.zip") you should copy at least the following folders into the main directory of the SD card: The "BIN", "SYS" and "TMP" (can be empty). The file "ESXMMC.BIN" must be copied into the folder "machines/next/".

Now you have to activate the whole thing for the desired personalities (not necessary for the "NEXT" personalities). To do this, go to the menu with the personalities when starting the Next with the SPACE key, select the desired one and open the settings for it with the "E" key. There are the menu items "DivmmcROM" and "Divmmc HW", both of which must be changed to "YES" with the SPACE key. You can then confirm the selection with ENTER and return to the main menu with a second ENTER.
By the way, esxDOS has a command ".snapload" to load .SNA or .Z80 files. It is easier to use the NMI menu.

3.4 SOME NEXTZXOS DOS COMMANDS

The NEXTZXOS is an extended +3DOS, +3e and IDEDOS with FAT16 and FAT32 support and esxDOS emulation layer. One difference to the "dot" commands presented below is that long file names are displayed and accepted here. With the "dot" commands, the names are shortened to eight characters (with e.g. a "~1" or "~2" at the end) - depending on how long a file name is, it may make sense to use one or the other command variant in order not to have to type too much. In addition, a file name must be given in inverted commas, whereas they can be omitted with the "dot" commands if the name does not contain any spaces. The "dot" commands also have the advantage that they work in 48K mode, where for example a "CAT" command expects an interface 1 with microdrive.
The structure of a file name with a path can look like this: "c:/folder/file.bas", the "c:" indicates the SD card that is inserted in the NEXT. With a "t:", on the other hand, the NEXT would try to load from cassette and "m:" is the RAM disk. The NEXT remembers the last drive used, so that a command without specifying the drive refers to it again.

- - List files: CAT, LS or DIR
- - Show more details: CAT EXP
- - Show only certain files: CAT "filespec" (e.g. CAT "*.bas")
- - Change to a subdirectory: CD "ordner".
- - Go one directory higher: CD ".."
- - Show current directory: PWD
- - LOAD "filespec
- - Load snapshot (game or programme): SPECTRUM "snapshot.sna" (or .Z80, .SNA, .SNX, .O, .P)
- - Copy file(s) from a to b: COPY "filespec" TO "destination".
- - Delete file(s): ERASE "filespec"
- - Move files: MOVE "filespec" TO "destination"
- - Create new subdirectory: MKDIR "folder"
- - Delete subdirectory: RMDIR "folder"

By the way, if you select a subdirectory with the NEXT's file browser and exit the browser with the Break key, the directory remains selected in Basic. This makes it easier to get to a certain subdirectory instead of accessing it manually with the CD command.

3.4 SOME NEXTZXOS "DOT" COMMANDS

With the "dot" commands (i.e. with a dot at the beginning) you can extend the command set, but there are already many predefined ones. You do not have to pay attention to upper/lower case. As mentioned above, you can also omit the inverted commas for file names without spaces. NEXT will automatically search for these commands in the directory "c:/dot", and you will get a list with CAT "c:/dot/".
Many commands have a help function that can be called with "-h" or "--h" (e.g. .DATE -h), for some it is sufficient to enter the name without parameters.
Here are a few useful commands:

- Display the keyboard layout: .KEYHELP
- Display free memory: .MEM
- Initialise real time clock (before first use): .TIME -di
- Display date and time (with RTC module): .DATE and .TIME
- Change date and time (with RTC module): .DATE "23/04/2020" and .TIME "18:45:00".
- Change subdirectory (without spaces in the name): .CD games
- Change subdirectory (with spaces in the name): .CD "more games".
- Display text file: .MORE textfile
- Copy files: .CP (see COPY)
- Move files: .MV (see MOVE)
- Delete files: .RM (see ERASE)
- List files: .LS (see CAT)
- Assign a TAP file as input to the drive "t:": .TAPEIN "file.tap".
- Assign a TAP file as output to the drive "t:": .TAPEOUT "file.tap
- List files in a TAP file: .LSTAP "file.tap".
- Play a wave sound file: .PLAYWAV "file.wav".

3.5 MINIMUM SD CARD INSTALLATION

To set up a minimal SD card (i.e. with only the most necessary files) for the Next, the files "config.ini" and "menu.def" in the folder "C:/machines/next/" must be created or adapted.

The "config.ini" is created automatically if it does not already exist. In it you can make settings that apply to all personalities (e.g. video settings, sound chip, joystick interface, mass storage). By default, there is not much in it:

- timing=8 → Video Mode
- (0...7 or 8 for video test menu)
- default=0 → entry in the "default.def",
- which is preselected at start-up (0 = first).

On the SD card with the Next distribution, you can find information on all settings under "/docs/config/config.txt".
The menu with the personalities can be configured in "menu.def" or "menu.ini" (also in the folder "C:/machines/next/"). When the system is started, the system first searches for the "menu.ini" and (if it is not found) takes the "menu.def". The "menu.def" is intended as a backup for the original from the Next Distribution and personal settings should be made in the "menu.ini".
The structure of the "menu.def" is also described in "/docs/config/config.txt".

Here are two examples:

```
menu=ZX Spectrum Next (stand-
ard),2,8,enNextZX.rom,enNxtmmc.rom,en
NextMF.rom
menu=ZX Spectrum 48K,0,8,48.rom
```

The structure is as follows:

1. the display name in the menu
2. type of machine
3. (0 = 48k, 1 = 128k & +2,
   2 = +2A & +3 & Next,
   3 = Soviet timings)
4. video mode (0-7 or 8 for selection via
5. boot menu)
6. ROM file for the machine
7. other ROMs (like DivMMC and Multiface)

The following files must be on the SD card (the list may not be complete):

```
/TBBLUE.FW
/machines/next/config.ini
/machines/next/menu.def (or menu.ini)
/machines/next/keymap.bin (for PS/2 key-
board, but must be there in any case)
```

For the ZX Spectrum Next:

```
/machines/next/enNextZX.rom (or en-
NextLG.rom)
/machines/next/enAltZX.rom
/machines/next/enNxtmmc.rom
/machines/next/enNextMF.rom
/nextzxos/enEsxemu.sys
/nextzxos/enOvrly.sys
```

For the real time clock (NEXT):

```
/nextzxos/RTC.SYS (identical with
RTCACK.SYS, which is the code currently
used)
/dot/TIME
/dot/DATE
/dot/I2SCAN
```

For the ZX Spectrum 48K:

```
/machines/next/48.rom
```

For the ZX Spectrum +2:

```
/machines/next/128-2.rom
```

The original ESX Dos loads:

```
/SYS/ESXDOS.SYS
/SYS/NMI.SYS
/SYS/RTC.SYS
/SYS/BETADISK.SYS
/BIN/ → esxDOS commands (like Next in
the DOT directory)
```

3.6 INSTALLING NEW PERSONALITIES

As mentioned above, you can install new Personalities (also called "cores" here) in addition to the pre-installed ones, although they do not necessarily have to be related to Sinclair computers. For example, there are also the Amstrad CPC 6128, MSX 1, Acorn Atom and video games like the Atari 2600 or the Colecovision.

The cores have often been converted from other FPGA computers like the ZX Uno or "MiST" and are not optimised for the NEXT, i.e. they usually only output a VGA video signal and require a PS/2 keyboard. In addition, the SD card as a data carrier for the ROMs and disk images can be subject to certain conditions, this has to do with which file system was implemented for the respective core. For example, I could only get the MSX Core to work with a 1 GB SD card and the "FAT" (i.e. FAT 16) file format with a block size of 16 KB. The Amstrad Core also worked with a 4GB SD card with FAT32 and a block size of 4096 bytes, but I had problems with the VGA output because one of my monitors could not display the picture (on another it worked). So a bit of trial and error is called for if it doesn't work straight away!

Another warning - together with the distribution 1.4 comes an update of the Next Core to version 3.01.06 (the current distribution 1.3.2 contains core 3.01.05). In it, the addressing of the SRAM memory in the FPGA is changed, which means that the above alternative cores no longer run and have to be adapted. But Victor Trucco will surely provide updates soon - at this point a big thank you for his commitment!

Some cores can be found here:

https://gitlab.com/victor.trucco/zx-spectrum-next-cores

In most cases, operating system ROMs of the respective computer (as a file) are needed, you can find them (with some searching) on the above website in the "Sources" section or also in emulators for Windows or Linux. They usually have to be located in the root directory of the SD card so that they can be found by the core.

I would like to demonstrate how to install a new Personality on MSX. For this we need a (as already mentioned above) 1 GB (nowadays rather "small") SD card (that means more precisely of the type SD or SDHC, but not SDXC), which we format under Windows with "FAT" (attention standard is "FAT32") and a "size of the allocation units" of 16 kilobytes. You can then copy the minimal SD card installation for the NEXT described in the last chapter onto it or simply a full NEXT distribution.

Next, we need the MSX core from here ("MSX1.bit"):

https://gitlab.com/victor.trucco/zx-spectrum-next-cores/-/tree/master/Cores

On the SD card we have to create a subdirectory called "msx" in "c:/machines/" and copy the "MSX1.bit" into it and rename it to "CORE.BIT". If you want, you can also create a text file "CORE.CFG" with the line "name=MSX 1" to get a nice display name for the MSX in the Next Boot menu.

For the MSX, you can find the necessary ROMs and files here:

https://gitlab.com/victor.trucco/zx-spectrum-next-cores/-/tree/master/Sources/MSX1/Support/SD

You can download them all at once as a ZIP archive, next to "History" and "Find File" there is a download button on the website (with an "arrow down" symbol), click "zip" at "Download this directory". The files and folders should all be copied into the main directory of the SD card (from the "SD" directory level in the ZIP archive, so that, for example, the file "NEXTOR.SYS"

and the subdirectory "MSX1FPGA" end up in the main directory). If you are wondering about NEXTOR, it is an improved version of MSX-DOS.
Then we have to open the file "config.txt" in the subdirectory "MSX1FPGA" on the SD card with a text editor and change it. In the first line there is a text whose characters represent the system configuration of the MSX (video mode, keyboard layout, Dos) - in the file there is also an explanation of the characters. I have had the best experience with the following value: "11EN0" which means NEXTOR active, Scandoubler on, keyboard layout English, NTSC video mode, without Turbo. If the picture doesn't look so good, you can play around with the values.
Now the SD card is prepared. Now we have to transfer the new core into the FPGA chip of the Next ("flashing"), please insert the new card! Attention when changing SD cards in the Next! Please remove power cable AND HDMI cable, otherwise data could be lost!

INSTALLATION:

1. restart the NEXT (cold start) and press the "c" key in the start menu. 2.
2. in the menu "ZX Spectrum Next Extra Cores", select an empty slot (e.g. 08) and press the space key to get to the core selection.
3. select the new core ("MSX 1") and confirm with ENTER - the core will then be burned into the FPGA chip.
4. leave the menu after the burning process with ENTER
5. Press ENTER to start the new personality.

As already mentioned, the video output of the MSX is via the VGA output and the keyboard input via the PS/2 connection. After the start you end up in DOS, which is similar to CP/M or MS-DOS. Here are a few useful commands:

6. "Help" - Help on the DOS commands.
7. "DIR" - Display the files / folders on the SD card
8. "CD Folder" - Change to a subdirectory
9. "CD ..<< - Go one directory level higher
10. "BASIC" - Change to MSX Basic
11. "a:\util\romload filei.rom /s" - Load one of the ROM files in the directory "a:\games\roms\" and start it.

4. MISCELLANEOUS

4.1 RASPBERRY PI ZERO (PIO) ACCELERATOR

- The Raspberry Pi has its own SD card for its operating system, which is currently version 0.99D. This is the initial version, so far there is no update but possibly with the NEXT 2. Here I have summarised some info about the Raspberry Pi ("RasPi"):
- 1 GHz ARMv6 CPU, 512 MB RAM, own mini-HDMI output, own SD card slot, two USB ports (the second, right USB is only for power supply!) → USB hub (with micro USB input!) for connecting a keyboard recommended.
- Operating system "NextPi", version 0.99D (based on "DietPi" which in turn is based on Debian Linux) on a 1 GB micro SD card.
- ietPi is a "lightweight" operating system, which means it requires little CPU power and memory. Theoretically, additional features such as a graphical user interface can also be installed.
- Playback of TZX files as audio to the Spectrum
- SID emulation (Commodore 64 sound chip)
- Atari ST (.SNDH) & Amiga (.MOD) sound playback
- MP3 Playback
- Data exchange between Spectrum and RasPi via UART
- Dual Screen possible with HDMI from Speccy + Mini HDMI from RasPi (the Next can send screens to the RasPi)
- Default User is "root", Default Password "dietpi".

The Raspberry Pi takes a little longer to boot up than the Next, so it may take a few seconds after powering up before it is ready.
Whether the RasPi responds can be tested via the menu "Command Line". Enter ".term" there to start the terminal programme. Then press the key combination SYMB + SHIFT + B to switch to a connection speed of 115'200 Baud (by default 2 MBit are set, but to be able to give commands to the RasPi you have to switch to 115'200 Baud). After pressing the ENTER key, a "SUP>" should appear on the screen, then the RasPi is ready for command input. If you enter "ls" you can see which programmes have already been transferred to the RasPi via ".pisend". The files are only temporarily stored there in RAM. With SYMB + SHIFT + Q you can then exit the terminal programme.
The easiest method to play sound or TZX files via the Next is via the browser of the Next. Usually the right method is found for each file type to play or start it (however, this does not seem to work for MP3 songs at the moment). In the following, however, I will describe how to do it manually for sound files.
To be able to play a song, it must first be transferred to the RasPi in the RAM disk. Then we have to reduce the connection speed to 115'200 baud (with ".pisend -q") to be able to give it a command afterwards. It can then take a few seconds until the song starts:

A Commodore 64 SID song can be played like this:

```
.PISEND file.sid
.PISEND -q
.PISEND -c nextpi-play_sid file.sid
```

or (with the cSID-light player on the RasPi):

```
.PISEND file.sid
.PISEND -q
.PISEND -c csidl file.sid
```

You can play an Amiga MOD song with the following command:

```
.PISEND file.mod
.PISEND -q
.PISEND -c nextpi-play_mod file.mod
```

or:

```
.PISEND file.mod
.PISEND -q
.PISEND -c xmp file.mod
```

To play an Atari SNDH song, do the following:

```
.PISEND file.snd
.PISEND -q
.PISEND -c nextpi-play_sndh file.snd
```

An MP3 song is played as follows (Attention the data transfer can take quite a while!):

```
.PISEND file.mp3
.PISEND -q
.PISEND -c nextpi-play_mp3 file.mp3
```

The song output can be stopped at any time with `.PISEND -q`.

4.2 WARNINGS AND TIPS

- - Be aware that the NEXT may also be powered via the HDMI connection! This can lead to data loss if you change the SD card, and it may also fail to make a cold start if you disconnect the power plug.
- - Be very careful with the fold-out legs on the bottom of the case (or better leave them folded) because they can break very easily!
- - Attention, the micro USB port on the right side of the RasPi (seen from the back) is only for power supply, it has no USB function! I think this connector is completely useless because the RasPi is powered by the NEXT.
- - If a demo is not displayed correctly, you should experiment with the video modes, maybe there is one where the display is better.
- - There is also a SPECTRUM NEXT WIKIPEDIA with answers to many questions:

https://wiki.specnext.dev

co

NEXT BASIC

BY JOACHIM GEUPEL

As far as programming is concerned, I'm not the expert. The time when I spent days and nights at the computer, no matter what kind, race or other affiliation, is long gone. Still, I've been dabbling a bit with the Basic extensions to the NEXT, since no one has done it before and it's really about time now....
Anyway, i know several new commands from other Basic dialects, e.g. the GfA-Basic on the Atari ST and the QBasic on the PC (DOS). However, these commands have a slightly different syntax than the NEXT BASIC. For example, in GfA-Basic commands cannot be chained with a colon. One command per line - that makes everything nice and clear. In NEXT Basic it is even necessary to chain some of the commands together with a colon in order to use them sensibly.
I will introduce and explain some of these commands here. Depending on how far I dig through the English manual, I will introduce further commands or their extensions and provide them with small examples. Where it seems appropriate, I will compare them with the syntax of GfA-Basic or QBasic. GFA-Basic for the PC, to venture into the NEXT dimension here, is available as a free download on the Internet. This programming language is being developed further and further and is now freely available under the Gnu licence.
The examples presented here refer to the firmware version V1.29 and the associated core V3.01.05. The firmware version V1.23 has some bugs that have been fixed with the new version and that I came across while writing this article in the section Integer Variables. So an update is worthwhile.
At the very beginning, it should be said that many of the commands are identical to those in the original Basics of the ZXS48 and ZXS128. They have not changed and I will spare myself explaining them again here. You can read them yourself in the manual. So I will limit myself to the extended basic commands of the NEXT. Other commands have been extended to make them applicable to the NEXT.
Of course, I am not without mistakes, so I am grateful for corrections and hints for improvements and ask you to spare me the shitstorm and correct me in a moderate tone.

The programme examples have been tested and should work, but I take no responsibility for any damage that may occur. One more note: the characters " and " are for clarification and do not have to be entered!
Let's start:

RUN AT 0/1/2/3

This command is nice! It saves having to manually switch the clock speed of the NEXT.
When the NEXT is switched on, the clock speed is normally set to 3.5MHz, which is the normal speed of the ZX Spectrum. Of course, you can switch the speed manually by pressing EDIT and then setting the desired clock frequency with the right/left arrow keys. But this can also be done in a programme and is quite simple.
As has been known for a long time, the NEXT has four different clock frequencies. The frequencies start at 3.5 MHz and double each other. The following frequencies are therefore 7 MHz, 14 MHz and 28 MHz. Accordingly, they are numbered from 0 to 4. The respective clock frequency can be taken from the table below.

```
RUN AT 0        3.5 MHz
RUN AT 1        7 MHz
RUN AT 2        14 MHz
RUN AT 3        28 MHZ
```

The example programme makes it clear. It draws circles on the screen at different speeds.

```
 10 LET f=3.5
 20 FOR n=0 TO 3
 30  PRINT "Taktfrequenz: ";f; "Mhz"
 40  RUN AT n
 50  FOR r= 4 TO 74 STEP 4
 60   CIRCLE 127,75,r
 70  NEXT r
 80  LET f=f*2
 90  IF n<3 THEN CLS
100 NEXT n
```

SPECTRUM

The command "SPECTRUM" can do a lot, at least on the NEXT and in the +3e-Basic version of the Spectrum +2A/+2B and +3. There it works the same or similar. I'll

stick to the examples in the manual here, they work and I don't need to reinvent them.
So, let's start from the beginning.
The simplest function is to switch from NEXT-BASIC to Spectrum48 mode. Here, the manual gives a nice example, which I will simply take over here. It explains quite clearly how the two Basic versions differ.

```
LOAD "C:/nextzxos/mounter.bas"
LIST
SPECTRUM
LIST
RUN
```

This command sequence loads a NEXT programme with which further drives can be registered in the NEXT-OS. It contains some commands that do not exist in Spectrum48-Basic. Entering SPECTRUM switches to the ZXS48-Basic and LIST reveals that the originally useful commands are not present in the 48-Basic and are replaced by graphic characters. Attempting to run the programme now ends with *C Nonsense in BASIC, 10:1*.
The dot commands are still there, so you can at least access the contents of the SD card, because CAT does not work without IF1. With ".ls" the content of the directory where the Next was located is listed.

SPECTRUM FILESPEC

The NEXT directly supports some of the common snapshot formats. These are z80, sna, snx, p, and o.
The command sequence
`SPECTRUM "/games/zx81/3dmm/3dmonstermaze.p"`
loads the ZX81 game "Monstermaze". The Next here also runs at the speed of the ZX81, since it is a ZX81 here.
`SPECTRUM "/games/classic48/darkstar.z80"`
loads the game "Darkstar". The NEXT now works as a ZX Spectrum 48. A small error should be pointed out here. If you enter the example from the manual, you will end up with nothing. The game is stored in the directory "games/classic48/" and not in Classic128.

SPECTRUM MODIFIER N

This command sounds complicated, which is caused by the MODIFIER n argument in the heading alone. In fact, it is quite simple. Here, the appearance of the editor can be adjusted quite straightforwardly. So if you prefer the classic green monitor display for certain nostalgic reasons, you can set it quite easily:

```
SPECTRUM PAPER 0: SPECTRUM INK 4
```

Voila! Now the display in the editor looks like it did when there were still green monitors. However, the last two lines remain in their original colour. If this was black writing on a white background, it stays that way.
If you have mastered basic arithmetic, you can also place the two commands in one instruction.

SPECTRUM ATTR N

Values are assigned to attributes such as FLASH, BRIGHT, PAPER, and INK. These are correspondingly for FLASH = 128, BRIGHT = 64, PAPER = 8 and INK = 0. The respective attributes are multiplied by the value assigned to them and added at the end. FLASH and BRIGHT can only be switched on or off. Their multiplication factor is accordingly only 1 or 0. INK and PAPER have eight colours; here the multiplication factor corresponds to the colour value. All results still have to be added.
So, in order to assign a value to ATTR, calculations have to be done:
Example:
If you want a green background with black lettering and BORDER and PAPER are to be equally bright, the calculation is like this:

```
No FLASH:          128*0= 0
No BRIGHT:          64*0= 0
Green PAPER:         8*4=32
Black INK:             0= 0
------------------------
Everything adds up to  32
```

So the command is SPECTRUM ATTR 32. As a result you have a squeaky green screen with black writing.
I would like to note here that ATTR 255 gives white writing on a white background and ATTR 0 the exact opposite.

SPECTRUM CHR$ N

Of course, the font width can also be set with this command.
SPECTRUM CHR$ 32 switches the editor to 32 characters per line, SPECTRUM CHR$ 64 to 64 characters and SPECTRUM CHR$ 85 to 85 characters per line. A value other than the three mentioned leads to error message B: Integer out of range, 0:1.
It is important to know that all variations of the command SPECTRUM refer to the editor. It is possible to include the command in a programme, but it has no effect on the output. I can recommend here to simply test it once.

SPECTRUM SCREEN$ N,T

With this command, the screen saver can be programmed within narrow limits. The type of the screen saver is determined with "n". There are only two possibilities: n=0 is an empty screen, n=1 shows the well-known racing square. With "t" the time is set after which the screen saver becomes active. The time span goes from 0 to 127 minutes. With "0" the screen saver is switched off and the screen remains bright.

IF - THEN - ELSE IF - ENDIF

The NEXT-Basic has the command chain IF-THEN-ELSE IF. With these commands, one or more conditions can or must even be queried in one line.
If we want ZXS48-Basic to evaluate a number for "less than - equal to - greater than", we either need three lines with IF - THEN or we write this query in one line and chain it with the well-known colon " : ".The command sequence in ZXS48/128-Basic looks like this:

```
10 LET a=10
20 INPUT "Enter number: ";z
30 IF z>a THEN PRINT z;" is greater
   than ";a
40 IF z=a THEN PRINT z;" and ";a;" are
   the same size".
50 IF z<a THEN PRINT z;" is smaller
   than ";a
```

The first two lines are identical in ZXS48/128-Basic with NEXT -Basic. Only from line 30 onwards is the query and evaluation carried out.

In NEXT -Basic, one saves the following IF-THEN and replaces it with an ELSE IF, whereby the ELSE IF cannot be used as an independent command but only works with a preceding IF. The command sequence is concatenated with a colon ":".
The command line then looks like this:

```
30 IF z>a then PRINT z;" is
   greater than ";a:
   ELSE IF z=a THEN PRINT z;
   " and ";a;" are the same size":
   ELSE IF z<a THEN PRINT z;" is
   smaller than ";a
```

Whether this procedure is simpler than that of 48-Basic remains to be seen. In GfA-Basic on the PC it looks like this:

```
INPUT "Enter a number: ";z
IF z > a
   PRINT z; " is greater than "; a
ELSE IF z = a
   PRINT z; " and "; a; " are equal to
   large"
ELSE IF z < a
   Print z; " is smaller than "; a
ENDIF
```

The difference is marginal. At the end of the IF-THEN-ELSE IF there is an ENDIF and everything is nicely indented. So no real difference, just clearer.

REPEAT - UNTIL - WHILE

From 48/128-Basic, we know only the FOR - NEXT loop as a limited loop, or the one we build ourselves by hand and end with an IF - THEN condition.
REPEAT - UNTIL is another way to form a bounded loop. The following example works as follows:
Line 10 defines a run variable. Line 20 starts the loop with REPEAT. Line 30 outputs the number and line 40 adds 1 to each. In line 50, the loop limit is defined, in this case with "greater than 10". If "a" is greater than 10, the loop ends and the end message is output. That's all.

```
10 LET n=1
20 REPEAT
30  PRINT "Zeile ";n
40  LET n=n+1
50 REPEAT UNTIL n>10
60 PRINT: PRINT "that's all "
In GFA-Basic 32 ist das sogar noch etwas
einfacher:
n = 1
REPEAT
  PRINT n; " Zeile"
  n = n + 1
UNTIL n > 10
PRINT
PRINT " that's all"
REPEAT – WHILE
```

This form of the loop can be varied with the command WHILE. Here, the end condition of the loop is simply specified with WHILE. The following example looks like this:

```
10 LET n=1
20 REPEAT
30 WHILE n<=10
40 PRINT "Line ";n
50 LET n=n+1
60 REPEAT UNTIL 0
70 PRINT: PRINT "That's all".
```

Note that line 60 is mandatory. It ends the REPEAT loop. To test this loop end, line 60 can simply be commented out or, alternatively, the 0 can be set to any other value.

INTEGER VARIABLE

NEXT has another variable type that can be used directly: the integer variable. Ok, this already existed in the previous Basic, namely with the command INT, but it is clearly different from it.
An integer expression can be used in every BASIC line in which a numeric expression is normally expected. To display an integer expression instead of a floating point expression, an integer expression must always be preceded by a "%" symbol.
There are only 26 of these in total. They are named A to Z. It is NOT possible to use more than one letter, as the acceptance of the input will be rejected with an error message. Variables with names like "%FRIDOLIN" or similar are not possible. Instead, "%f" works and is not rejected during input.
Why use integer variables at all?
Until now, floating-point variables, which also allow more than one letter in the variable name, were good enough! In any modern high-level language, integer variables are the norm. They offer two advantages that floating point numbers do not.

- They occupy less memory.
  In Next, they are stored in additionally provided RAM, which is reserved by NEXTZXOS, and therefore do not occupy space in the normal BASIC/variable area
- They are faster in execution, especially in longer loops. This is due, among other things, to the memory allocation. Since they see in the memory area provided, access is faster. More on this later in the text.

A small example:
To run this example, it makes sense to set the Next to 3.5MHz clock frequency. With 28MHz there is no noticeable difference:

Floating-point variable	Integer variable
10 FOR N=1 TO 704	10 FOR %N=1 TO 704
20 PRINT "*";	20 PRINT "*";
30 NEXT N	30 NEXT %N

The image build-up in the second example is much faster than in the first.
The number range goes from 0 to 65535, i.e. over the range of 16-bit numbers. Values greater than 65535 and less than 0 show the corresponding equivalent. The numbers declared as integers are unsigned. %-1" becomes "%65535" and "%65536" becomes "0". Negative numbers are therefore not possible. The example below shows this.
If a variable is declared as an integer with a "%", it has no decimal places. The result is the same as with the INT command.
Example:

```
10 LET %A=PI
20 PRINT PI
30 PRINT INT PI
40 PRINT %A
```

PI is a seven-digit constant. It is stored in the Spectrum, but does not exist in MSX 1 and MSX 2-Basic, for example. In line 10, PI is passed as an integer variable. Line 20 outputs PI, line 30 uses the INT command to form the integer value, and finally the variable "%A" is output. The result is:

```
3.1415927
3
3
```

You can also calculate with the integer variables. Adding, subtracting, dividing and multiplying works in the same way as with floating point numbers, but the number range is only between 0 and 65535.
Example:

```
10 PRINT %65535/15
20 PRINT 4369*15
```

The results are "**4369**" in line 10 and "**65535**" in line 20. So we are still in the 16-bit range, because **65535** corresponds to "**1111 1111 1111 1111**" in binary.
If we calculate with integers, the result looks completely different.
First as a floating point number, then as an integer:

```
10 PRINT 4096*16
20 PRINT %4096*16
```

The result in line **0** is **65536**, but in line 20 again expect "0". If the number is preceded by a "%", it looks different.

We have exceeded **65535**, because the value **65536** corresponds to **1 0000 0000 0000 0000** in binary, i.e. 17 bits.
We can now continue the game as we like.
So the result is "**%4096 * 17**" = **4096**, binary **1 0001 0000 0000 0000**, i.e. even more than 16 bits.
Calculating with integers is undoubtedly very fast, but it only moves in the positive number range from **0** to **65535**.
Negative numbers are a special case. They are simply not possible. The loop in the following example does not work.

```
10 FOR %n= -1 TO -10 STEP -1
20 PRINT %n
30 NEXT %n
```

In the previous firmware version, it broke off with the error message B Integer out of range in line 10. In the current version, the loop starts with **65535** and ends with **65526**.
The old firmware also produced another interesting effect: if a FOR-NEXT loop ended at 65535, it started again from the beginning with "0". In the new version, the error is fixed.
Dealing with integers that are declared as "%" is sometimes not easy. So it is worth trying out.
That's it for this time. There are a few other new commands like ON ERROR and the point commands, but I'll save them for the next issues.

ADVENTURE CORNER

BY THOMAS EBERLE

Adventures are games in which you choose the next action, either by clicking on icons or entering text. They differ in this way from action games, which require quick and precise control, and Adventures usually give the player all the time in the world to find a solution. They are an essential part of Spectrum culture and, of course, have not been absent from our software reviews until now. With the year 2019, however, not only did the software house "Zenobi" return to the Spectrum, but a new generation of authors, also in Germany, emerged who created high-quality adventure games. Adventures were also on board at the launch of the ZX Spectrum Next; the Magnetic Scrolls adventures were obviously well suited for implementation, even though these adventures already existed on the Spectrum 48k, but were now expanded with graphics taken from the Amiga version. Gilsoft also announced a new version of the "Professional Adventure Writing System"

(Paws) for the Spectrum Next and so it seems that one thing led to another and more and more adventures appeared or are already announced.
We had presented some adventure games in our games section several times, but now it turns out that this area calls for an extra section. Adventure games are to be judged completely differently from action games. Most Adventures didn't have Sound, with the exception of "The neverending story 128k", which was released in 1985 and was one of the first programmes that used the sound possibilities of the Spectrum 128k. However, it quickly became apparent that an adventure game demands silence rather than a melody that also gets on your nerves after the thousandth repetition. Above all, text adventures all look the same at first glance and do not differ graphically. The rating of a game is therefore 99% based on the story and the atmosphere. Ultimately, it's like an exciting book, but interactive, because you have to solve tricky puzzles at the crucial points. That's how a playtest of an adventure game works differently. You have to pay more attention to the story and unfortunately you can't recognise a bad game at the first click. Some programmes, especially from the UK, have the typical British humour and it is not always easy to understand the context. A number of adventure games are also in Spanish, Czech or Russian language. None of those languages I do understand well enough to play an adventure game, and in the case of Russian I can't even recognise the letters. So we will leave this section out, but readers are welcome to send in reviews for this section.
I have now created this section for the time being, but actually I am not even a big fan of this genre. I'm not really the right person to run this section and I'm just taking over until someone else is found. So far I haven't had any success with it, so I want to call for it here in the magazine as well. I am happy to continue to do the layout, but I need articles from adventure players. Please send them to me in the usual way, preferably by e-mail to

thomas.eberle@sintech-shop.de.

But now to the adventures I have reviewed for you.

»ALIEN RESEARCH CENTRE II«
BY PENSION PRODUCTS, JOHN WILSON

John Wilson has done it again. The first game in this new section is by none other than *»The Balrog«,* who has given us many years of excellent text adventures with the software house *Zenobi*. An adventure software review can never be complete without playing through the game and I am far from it. But it is definitely an exciting story reminiscent of the Alien films. Drawing a map is definitely necessary in this game, because there are some rooms that are similar in description to others, but are part of a puzzle. Tension is definitely there, because death can lurk around every corner. The game was written with the *»Professional Adventure Writing System«* (*PAWS*) and since this is pretty much the best tool, it works perfectly. However, it was also usual for this author to include some funny comments on certain swear words and sometimes a "*help*" function. In this game, however, that was left out. So neither swearing nor shouting help will do any good, just find the alien.... before it finds you.
You can find the game here:

https://zxart.ee/eng/software/game/adventure/text-only/alien-research-centre-2/alien-research-centre-22/

»BEHIND CLOSED DOORS - EDIT 1: THE DIRECTOR'S CUT«
BY ZENOBI SOFTWARE, JOHN WILSON

Is it possible to program an adventure game in which the objective is to leave a small, perhaps two m², quiet place? *John Wilson* had already proved this in 1988 and his story about a simple visit to the toilet brought several sequels. We don't need to talk about the story, no one wants to notice that they are sitting on a toilet seat brushed with super glue when they are reading about crocodiles in the sewers in the newspaper. It is interesting that this sequel was made on the online system *»Adventuron«* and then ported to the Spectrum using the *»Adventuron to PAW convertor«*. This makes it possible for many authors to create a Spectrum adventure without much programming knowledge, so the authors can continue to put their energy into the story.
I don't want to say anything else about *"Behind closed doors",* it's a tricky but also fun task and without doubt a very good adventure game, but every adventure game fan will already know it and the Director's Cut doesn't change that much. If you still want to try, you can download the game here:

https://spectrumcomputing.co.uk/entry/35099/ZX-Spectrum/Behind_Closed_Doors-Edit_1_The_Directors_Cut

»General Zenobi news« can be found at:

https://zenobigames.blogspot.com/ .

This page also takes you to *»Behind closed doors« - parts 1 - 9* , some of which have been remade.

»BULBO INTREPID ADVENTURE«
BY PENSION PRODUCTIONS, JOHN WILSON

Once resurrected, John Wilson finds pleasure in creating new adventures. Bulbo is another hero character, who has appeared in his adventures before, here he too has been given a new adventure.
Bulbo is a kind of parody of the hobbit "Bilbo" from "Lord of the Rings". So we are definitely dealing with a small but brave hobbit who has already had a few adventures. The adventure tells a story that does not necessarily have to end in murder and manslaughter. Does Bulbo embark on another adventure or does he prefer to indulge in his twilight years with some pipe-weed and the certainty that his life could not be more boring? It all depends on what choices you make.
It reads like an exciting Tolkien story and somehow it is. There is no real suspenseful atmosphere, but there is one of wit and curiosity. Anyone who love another parody of "The Hobbit" is recommended to play this game, but of course only after playing the absolute cult game "The Boggit" (which is not by John Wilson).
Bulbo's first new adventure can be found here:

https://www.spectrumcomputing.co.uk/entry/34670/ZX-Spectrum/Bulbos_Intrepid_Adventure

The no less funny sequel "Bulbo and the blue dragon" can be found here:

https://www.spectrumcomputing.co.uk/entry/34876/ZX-Spectrum/

»DEER CREEK«
BY GARETH PITCHFORD

Thanks to the tool »Adventuron« this adventure was also created. Ultimately, text adventures can't be judged by programming, graphics or sound like other games, but to a large extent by the story. »Deer Creek« takes a new approach here, because the game begins with a pupil who should rather not have fallen asleep in class. He wakes up in a completely different place and has to solve the puzzle to get back to school. How many pupils really would do that? The instructions have some useful hints for them, they introduce you in a playful way to the systematics of an adventure game, a witch explains to you how to play the game. Then you understand and can get started.
The game has atmosphere, even if the story seems like it could just as well have been a Dizzy-like game. Through conversations you have to find out how to help the people in »Deer Creek« and solve the tasks.
You notice a lot of details, humour and also tricky puzzles. However, English is of course a foreign language for me and I can't follow every word joke and sometimes there are words in the explanations that I had to look up (although I actually always assumed to speak perfect English). In the end, it is getting trickier.
Absolutely recommended. Download at:

https://spectrumcomputing.co.uk/entry/34909/ZX-Spectrum/Deer_Creek

»ESCAPE FROM DINOSAUR ISLAND DX«
BY ADVENTURON SOFTWARE LTD

Another game whose existence we owe to the new *»Adventuron Classroom«*. The story: It could happen to anyone... You are driving around in your hot air balloon, get caught in a storm and land in the middle of nowhere... Unfortunately, there are all kinds of dangers on

the island and so you should leave it again quickly. The story is good, the game largely does without meaningful jokes and concentrates entirely on the fight for survival. If you can put yourself in the situation of being stranded on a desert island, you might have one or two ideas. Otherwise, it helps to try things out. At the beginning, the game helps you through the first steps in a kind of tutorial. Thus, the game is also suitable for adventure novices. Anyone who wants to try it out:

https://spectrumcomputing.co.uk/entry/34910/ZX-Spectrum/Escape_from_Dinosaur_Island_DX

»THE HOUSE ON THE OTHER SIDE OF THE STORM« BY PABLO MARTINEZ

What does the Spaniard Pablo Martinez have to do with the German adventure coder Stefan Vogt and what is their connection to Tim Gilberts, the former PAW legend from »Gilsoft«? The answer is »DAAD«. It is an adventure writing system based on »QUILL« and was once developed by »Gilsoft« for a Spanish software house. It was the most advanced system, but got lost over the years and was rediscovered, restored, improved and made available in its new form by Tim Gilbert and Stefan Vogt with the help of Pedro Fernandez. With this system DAAD, Pablo Martinez created the game that I would like to present here.

The story: The weather is unpredictable, just a moment ago you were sailing through the air in a boat (???) and then a storm tears the boat apart and you land... yes, where actually?

The creepy story with a slightly esoteric character is exciting and quickly takes you in. The parser is extensive, understands a lot and yet only does what it is supposed to. In fact, the game seemed rather straightforward to me in the test. You get a puzzle, you solve it or.... Game Over. It seems as if there is only one way to the goal, and finding it is the tricky part.

Interesting are the possibilities »DAAD« seems to offer, the author has played a lot with different colours in the text, it's unbelievable what effect is created in a text-based game if you only change the background colour. You don't have to like the story, in fact it's too ghostly for me too, but the system as such is very good and I'm sure many more adventures will come out of it.

Here is the link to »DAAD« for now:

github.com/daad-adventure-writer/daad

And the resulting game:

»The House on the Other Side of the Storm« at Spectrum Computing - Sinclair ZX Spectrum games, software and hardware.

If you always had an adventure game idea and wanted to realise it, I think now would be a good time.

»TWO DAYS TO THE RACE« BY DAVIDE BUCCI

A new author and a new tool. Frenchman Davide Bucci uses »AWS« (Adventures Writing System) for his adventures. The difference can be seen in the font alone, which is much smaller than in the other well-known tools, but easily readable. The 64-character font is reminiscent of word processing programmes like »Tasword« and it is clear that anyone who uses such a tool wants to write a lot. And that's exactly what Davide does, his first adventure is an exciting detective story about a missing car manufacturer. The locations are described in detail and there are many secrets to discover in each room. Not everything you read is crucial to the solution, but the atmosphere is great and soon you are yourself in the role of Emilia Vittorini, who has to solve a crime. I'd like to write more about it, but it's very tricky and I don't want to give away the few things I found out. However, the game is divided into four parts and so it promises an extensive and tricky adventure for long evenings. The parser is very good and understands the usual commands, but also combinations. I am quite sure that all adventure fans will have a lot of fun here.

Get all the parts:

Two Days to the Race at Spectrum Computing - Sinclair ZX Spectrum games, software and hardware.

With that, I'll end the adventure corner for today, knowing full well that I couldn't present all the titles. Zenobi alone has released ten adventures under different labels in 2019, and others have also been busy. If you have acquired a taste for them, you are welcome to present your favourite adventure game or solutions. Maybe we will see a graphic adventure soon, but for now only text adventures have been created.

Until next time!

TE

GAMES 2019

Despite various calls, unfortunately no one has yet been found to present new software with us in the team. The problem is, there are a lot of programmes that want to be reviewed, especially games. Today Ellvis will present most of the programmes, with a little help from Jungsi (specially marked). But we are confident that another reader will be found for the next issue.

In SUC Session 228 we introduced you to the hits of 2019, about half of the releases that came out. Around that time, a real adventure game hype started, and these are now presented in a separate section. So here we present all the other freeware games, the ones that have always been freeware and the ones that are freeware now.

»JUST A GAL« BY ZOSYA ENTERTAINMENT

It's not everyday that we get a new racing game. And even less times happen that the racing is on the motorbikes. The weather is good and we have some time, why not to try it?

The game load on standard 48K Speccy. While beep music is playing, choose controls wisely, because you cannot come back to here once you start playing. After controls, we can select 3 different game

types. First one is a single race. This is good for practising as you get 2 or 3 laps race on one of 3 tracks you can choose from (Slovakia, Norway and Mozambique). Each track have different graphics and you start on 24th position. Once you start the race, your current place is printed on the screen above the track. Selecting Championship will get us into another menu where we can choose between Qualification and Race, if we decide to qualify (we don't have to), we will get a chance to race empty track to get as best time for a lap as we can. That will have effect on the start possition in the race. Last option is Arcade. This is racing for a points. The bike is accelerating itself, we have to just steer, nothing else. There is plenty of other bikes on the road, so we will have to take care not to crash, we have only 4 lives here. Also, every curve is fine here, we can go through always without braking.

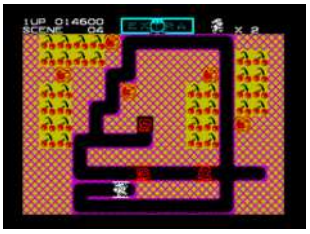
That was quite a few options, how does it look like technically? Well, not bad, but I have few reservations. At first, the graphics are all good. The game is monochrome, but it is clear what is what, different tracks have different horizon, there is even tilting which is really a nice touch. On the other hand, the place is empty. The road is marked just by the side stripes and that is all, nothing is around the track. All the racers look the same, but the bike is very responsible and the game react very well on the input. In comparison to other racing games, I found it much easier to outrun the opponents in the curves then on the straight road where they all just run away much faster then my bike. That need a bit of practice and as the game is not the most easy, it is possible to get to the first places after some practice. Sound is there, but just for our bike, none of the opponents have any. That add to the, sometimes weird, atmosphere when I had a feeling that I am alone on the track.

Overall, this is good fun and technically a good racing games, I am just not sure if it will last for the whole Championship.

Download for free at:

https://spectrumcomputing.co.uk/entry/35160/ZX-Spectrum/Just_a_Gal

»MR. DO!« BY ADRIAN SINGH AND MARK R. JONES



Mr. Do! is a successful arcade by Universal from 1982. Although it was ported to many home computers and consoles, it never reached the Speccy as an official release (although some unofficial ports happened - Farmer Jack being the most faithful one). That changed back in 2019 and let's take a look how good the Spectrum version is.

Mr. Do have to dig tunnels to get cherries. The problem is, he is not the only one who want them and very soon he have to avoid nasties (called creeps in the original). Luckily, enemies usually cannot dig tunnels, so they have to just follow. There are some apples around and leading the creeps through the tunnels to the right position, apples can kill them. Besides apples, Mr. Do have also one power ball. When he throw it, it will bounce around the tunnels for a while. If it touch a creep, it will wipe it out, if not, you have to collect it to use it again. Once all creeps are released, their entrance will change into a bonus. If you collect that, another creeps show up, some of them with a letters. If you wipe out the lettered ones, you get a bonus, collect EXTRA and you get a life. Every 3 levels you get a small statistics with a funny animation.

Technically, the game is really nice. Colourful graphics, nice animations and very good responsibility makes the game a pleasure to play. There are melodies and plenty of sounds to support the game and overall impression is very good. It is not the easiest game thought.

Mr. Do! is a faithful conversion of an arcade classic and good one for spending few minutes playing some proper arcade action!

Download at:

https://spectrumcomputing.co.uk/entry/34817/ZX-Spectrum/Mr_Do

»THE ORDER OF SLEEPING DRAGON« BY EVGENIYA ZAPOLNOVA AND NIKOLAY ZAPOLNOV

RPG is a genre that is getting more and more attention of game developers in last years. Such games need a bit of a story and are usually more complex, taking much more time to go through. That is also valid for The Order of Sleeping Dragon. How good is it?

There is no intro and the story start to uncover right after the game begin. Some demons attack the vilage and after defeating them things go complicated. Our father is been killed and we go and search for help in close monastery. We get some training and gather fighting skills and then we get betrayed. So, story is not complicated, but it's with some twists so it is quite interesting.

The game uses quite a lot of keys. There is a key for an action (like talking and opening a chests), another key for fighting, another key to enter inventory and so on. Good thing is to have a 5 special keys where we can place selected spells or health potions for easy access, this is a great help especially later in the game when the fights are more complicated and use of more then 1 spell is needed.

Graphics are simple, but clear and it is easy to see what is going on. Enemies are easily recognisable, even plants we have to collect are simple to spot. Most things are based on character designs so even with a lot of colours, we don't get much of colour clashes.

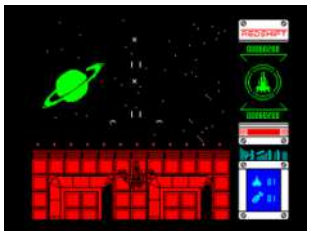
About sound, there is no music although the game run on Speccy 128K only. Sounds are for beep, but are quite good for what they are. Every action have it's own sound, but when you wander around the game it is silent.

The Order of Sleeping Dragon is quite a big game that you won't finish in a few minutes. It is vast and few story twists make it interesting. The lack of music is letting it a bit down, but overall, it is a very nice addition to the modern Speccy rpg games and worth of every minute you'll spend with it.

Download for free at:

https://spectrumcomputing.co.uk/entry/35163/ZX-Spectrum/The_Order_of_Sleeping_Dragon

»REDSHIFT« BY WORLD XXI SOFT INC.



Redshift is a *shoot'em up*. And one of the very finest that came out in last few years I have to say! We get latest technical marvel in space fighting industry and there is no lack of enemy to fight. Everything is being watched from the above and we fly up the screen to free the universe.

Our ship start small. It is fast but not armed too much. As we make our way through the enemies, we collect power-ups. More we get, the ship grow more and also more armed it become. It is also important to know that all the upgrades we get are coming with us to the next level.

The action itself is fast and frantic. Very soon we fly above enemy platforms trying to avoid bullets and shoot as much as we can. There are both, flying and ground enemies, later ones usually leave a medal (those are good for increasing score) and flying ones often leave some kind of upgrade. As in every good shoot'em up game, you don't have much time to wonder about details, you have to keep shooting and collecting what ever comes closest to you. Levels usually contain few different platforms, often coming in different colours and at the end of each level is a bigger base to be destroyed. If we get into troubles, we can use a special bomb killing most of the things on the screen and also we can call for a support. That will bring another spaceship to the screen which is autonomous and it keep shooting and flying around. It is a good help! Both, the support and bombs are just in few amounts, but we can collect those as a bonuses. At the end of each level we get extra points for amount of support and bombs that we actually haven't used.

There is not much time to look around during the play, But we have a information panel on the right side of the screen. At the top we have our actual score, then we see a big picture of our ship. The rings around are shields and if we lose all of them, we will start to lose parts of our ship. If we lose everything, the ship is wrecked, we die and all humanity die together with us. Under the ship we see hi-score, under that is a damage meter and then a number of supports we can call for and number of bombs we have.

Technically, the game is a gem. Everything move smoothly, even when the screen is full of enemies. Once a while we come to the moving background sidewise, that is again very smooth and it look great. Game is mostly monochrome, with changing colours once a while, it look good, but you may see a bit of chaos once the screen is full of bullets. But it is still manageable and the actual playability is great. There is never this feeling that the game is unfair and it is really fun to play. The game support Speccy 128K only, but it make it to really use the AY to the max. We have a music and sound effects during the play, there is also a great amount of various settings in the game menus. This is a huge game and it's worth of playing if you like this type of games at least a little bit!

Download for free at:

https://spectrumcomputing.co.uk/entry/34714/ZX-Spectrum/Redshift

»ZX LARRY« BY RAFAL MIAZGA

Leisure Suit Larry is a series of graphical adventures about ageing *Larry* and his escapades with women. It is a genre of games very rarely seen on a Spectrum, in fact, *Larry* never did it to the Speccy at all. But he changed his mind and I will take you to see how does he look like.

The game is point and click adventure. Upper half of the screen contain the location, lower half of the screen contain commands menu on the left, inventory in the middle and a dialogue area on the right. Down left is our current score. We start in a front of bar and using a cursor and a menu we can examine things, go to places and other actions. The aim of the game is to finally find a girl and stop the life of a local drunker. As an example, we can go to the bar and talk there to bartender to get a whiskey.

Objects, people and places with some possible action are those that show up under the cursor. It is good way to go to choose "Look" and search the place, you'll then get an idea what is available. But even that made me a bit stuck shortly after the beginning. It just need a time and thinking, so give it a try once you have nothing else to do as this is not really a causal game. There is not too much of locations, but the game itself still isn't very easy.

The graphics are really nice, it is easy to see what is what. Texts are clear and funny, the game keeps good mood and is really nice to play. There are just 2 things that could be done better, the cursor is just too sensitive and fast (if you hold down caps shift, it slows down) and music is too short and repetitive, so it goes a bit onto the nerves after a while. But overall, the game is really good and one of those rare adventures that are worth enough to invest some time into.

Download freely at:

https://spectrumcomputing.co.uk/entry/34721/ZX-Spectrum/ZX_Larry

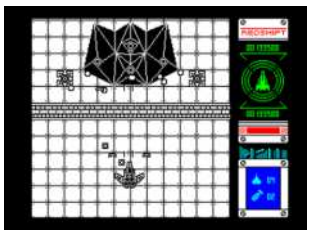
or buy a physical copy at:

https://bumfungaming.com/shop/zx-games/larry/

Conclusion by Jungsi:

Unfortunately, the control is not optimally solved and the cursor is therefore very sensitive and fast, which can be slowed down with "Caps Shift", but is still not great with a joystick. But still, the idea of this implementation is great and the engine used here could form the basis for similar games.

»REDSHIFT« BY ARIEL RUIZ



Redshift is another entry in the *ZX-DEV MIA* remakes competition 2019. The author has already proven his talent with *Carlos Michelis* and *Thieves School* and presents with his new game the remake of *Galaxian III* which is listed as *MIA*. In the introduction, the story of *Redshift* is presented.

In the year 2992 there are two factions fighting for control of the multiverse. One faction is led by *Prince Kallux*, who

has fast and powerful spaceships and wins countless battles. Humanity on the other side begins to lose faith in its survival and with last desperation develops the spaceship *Redshift*, which is controlled by the player.
This starts a shoot'em'up in which five galaxies have to be cleared of enemies. There are three difficulty levels corresponding to different parallel universes with variations in the enemy's defences. Once all fifteen galaxies have been defeated, the mission is complete and is rewarded with the final screen.
Enemies are plentiful in *Redshift*, some of which are relatively easy to eliminate, but some others are nuisances, not to mention the bosses at the end of each galaxy. The spaceship does have a few aids, however, such as the plasma shield that can withstand up to three shots and regenerates automatically. In addition, capsules can be collected that dock onto the ship and improve its firepower (shock wave generators and intelligent mines). You can also fire a bomb that causes great destruction and call in a clone for support, which protects the Redshift for some time, absorbs enemy shots and helps to destroy the enemies.

Control:

- Kempston/Sinclair joystick
- Kempston mouse
- keyboard

Keyboard layout:

- **O** - left
- **P** - right
- **Q** - up
- **A** - down
- **Space** - fire
- **L** - request drone
- **Enter** - bomb
- **H** - pause
- **R** - end

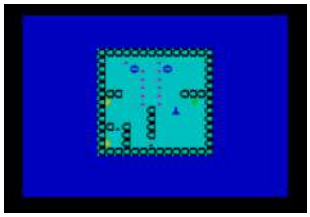
If the shockwave generators are connected, the waves can be additionally focused by pressing the up or down buttons or the right button on the Kempston mouse when firing.
By selecting the *"Black Redshift"* option, *Redshift* and allied ships are displayed with black paint to improve visibility and minimise "colour clash".
Conclusion by Jungsi:
The speed of the game is great and you almost think of the NEXT, even though it is the 128K Spectrum. The sound by Richard Armijo is great and it sounds more like an arcade machine than a Spectrum. An absolute highlight for those who like this kind of games and technically brilliantly done!
Get it from

http://www.worldxxisoft.com/games.html

Currently (05/2021) the game can also be ordered in physical form from

www.bitmapsoft.co.uk.

»SPY SCHOOL 2« BY MOGILEW



Good logic game shine not with the graphics but with the playability. Even if partialy programmed in BASIC, it still can be fun. Let's join the *Spy School 2* to see that for ourselves.
After a short load we get a simple informations and any key will get us right into the game. Using *OPQA* we move around the screen in a form of a blue stick. We have to collect various coloured objects to move to the next level. But every object have it's own security system which we have to avoid. So, how does it work?
Every object we need to collect point to some direction. When we collect it, it's security system will activate a laser beam in the direction the object was pointing to. This have one exception, the smallest black objects, those will activate the laser the opposite direction we encounter them. We have to avoid the laser! When lasers meet, they can partly eradicate each other which makes free space that can be usefull for us. This is more or less the only strategic element of the game. Screens differ by size and layout of the maze, so we should take a look first how to proceed. As levels go, they are more and more complicated. Unfortunately, there are no passwords, so the game have to be played always from the beginning. Once we're stuck, R will restart the level, M will bring us to the beginning of the game.
Graphics are simple *UDG*, but responsibility is good and it is nice to play. Simple rules, no time limit, no score or basically anything that will disturb us from the game is just not there. There is also no sound except a beep at the start of each level.
Spy School 2 is nice little logic game that is simple enough to jump into it and quite fun to play. Not the best looking one ever, but fun is what counts here.
Download for free at:

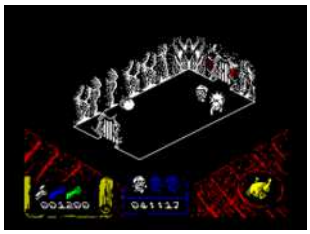
https://spectrumcomputing.co.uk/entry/35214/Misc/Spy_School_2

»TETRIS 2019« BY OZZYOSS

Tetris is one of those games that are simple, done in millions of variations and still being fun to play. *Tetris 2019* is great example of that and I will tell you right away why is that, it bring more variety to it.
Controls are keyboard only, but we can define own keys. When we start the game, we will see the main difference. Instead of playing one level with increasing speed, here we have targets. For the first level it is to get 4 lines disappeared. Once we do that, we move to the second level. Here we have to destroy the bricks that are already there and also meet another target. And so on, this is what this game is based on. Just to explain the targets a bit more, number of links mean, how many lines we have to destroy at one go - 1 links is easy, 4 links can be done only with the longest brick. 2 and 3 links are in between those two. Even more fun will come in later levels when we will get more shapes, the game become much more difficult.
Tetris 2019 is a nice example of how simple ideas can be extended to keep the game more exciting. It is long lasting game that is easy to get into and hard to turn off.
Download for free at:

https://spectrumcomputing.co.uk/entry/35477/ZX-Spectrum/Tetris_2019

»TIKI TACA« BY CLIMACUS, ERRAZKING



Filmation games from Ultimate were a revolution in the gamming. *Knight Lore* made a huge impact on the industry and we see isometric titles popping up once a while till today. But making it more interesting - what if we take old classic *2D Atic Atac* and remake it into isometric game? *Tiki Taca* is exactly that. It make the game familiar and we can jump into it right away without trying to find what to do (for those who don't remember - we need to find 3 pieces of a key and escape the mansion). But the game is still new enough to be interesting and fun.

The graphics are really nice and detailed. The mansion look great this way and the feeling of being trapped inside is better then in the original in my opinion. The downside is the lack of colours, but it is obvious why, colour clashes would be just too much otherwise. The sounds are very similar to the original game. The action itself is fast and it is impressive how the game nearly never slow down. The rooms are mostly empty (as they are in the original), but all the details are there - randomly closing and opening doors, travelling through clocks, different levels of the mansion (there are no steps here, but trapdoors and lifts). We can also still choose one from the original 3 characters to play with.

If you at least slightly liked the original *Atik Atac* from *Ultimate*, just go and give this one a go, you'll not regret.

Download for free at:

https://spectrumcomputing.co.uk/entry/34685/ZX-Spectrum/TIKI_TACA

»THE VALLEY OF RAINS« BY ZOSYA ENTERTAINMENT

Her mother was a water lily, her father was an ant. Now she come down to the Valley of Rains to bring back life to this place. Wouldn't you like to help her?

The Valley of Rains is a hostile place. It is full of birds and insects that try to feast on us, it's a place of traps, monsters and dragons. But still, looking around you can see it's former glory. And we are here to run through and fight. As we run, we go through different parts of the valley, connected with a gates. Those are usually closed and we have to find a key or fight the guards. In a case of fighting, the guards are the birds sitting on the top of the gate.

As we run around, we can collect white flowers. But most importantly, we get a lot of power-ups from the killed enemies. From the time extension (yes, we have to hurry due a time limit), to different kinds of bullets, health, shields and other things. Action is really fast but it's always clear to see what is happening.

And how does the technical side of the game look like? Well, in a simple words, it is stunning! The graphics are simply beautifull. Everything is big, colourfull, fast moving. There are layers of paralax background, we see water splashes when we run on a lake. There are good sounds for beep and whole game is very responsive. It is not overly complicated and due the graphics, there is this "want to see more" feeling during the game. I was personaly hooked by the sunset right outside of the lost temple...

The Valley of Rains is a great fun packed in a stunning visuals. It reminds quite a bit of Savage 1 but I think it plays a little bit better and it's easier. For an atmosphere there is also original soundtrack that should be played as audio during the game play.

The game is free to download at:

https://spectrumcomputing.co.uk/entry/35155/ZX-Spectrum/Valley_of_Rains

and you can buy a physical copy of the game and download the original soundrack at the

www.zosya.net website.

»YAZZIE« BY RETROSOULS

Yazzie is a clone of *Lode Runner*. We are running around the castle and have to collect all the gold bricks. There are also some pickaxes lying around so we can dig holes. The difference with original *Lode Runner* is that our enemies will fall through the holes we dug.

The game is made using *Nirvana+ engine* so it is very colourfull. Flames are nicely animated and all the characters too. There are bridges to activate, special places to fall through and we will get also mines. Luckily, they won't kill us, just break through the platforms. Our advantage is speed, we are faster then our enemies, be it on the ground or on the ladders. There are separate versions for 48K and 128K Speccies, later one having music and sound effects during the game.

Response is very good and it is real fun to play, another clever small game from the Retrosouls that shouldn't be overlooked!

Download for free at:

https://spectrumcomputing.co.uk/entry/35157/ZX-Spectrum/Yazzie

»PTM – LICENCE TO KILL« BY ULTRANARWAHL

This is another game that has been released as part of the *ZX Dev Mia Remakes Compo 2019*. In this, the game was inspired by the *James Bond* title *Licence To Kill*. As with many other recent developments, *AGDx* by *Jonathan Caudwell* and the *AGD Musicizer* by *David Saphier* were used.

According to the developer, *PTM* is not only a platformer, but also has elements of a shooter and an agent story. This agent is on a mission to stop the *Dorgen boss Leche Lacto*. The development of the title took 80 hours spread over five weeks.

Story:

Agent 98 is one day away from retirement, which revokes his permission to assassinate. Who should show up in this small window of opportunity, none other than nemesis and *major crime boss Leche Lacto*.

Agent, smash *Lacto's* drug and money laundering empire and enjoy your well-deserved retirement.
Good luck!
In the first, third and fifth levels you have to eliminate the enemies with a crosshair, in the second level you have to find some items, in the fourth level money and the way to the exit. The patrolling enemies simply have to be shot. In the short final battle, the bad guy's boat must be sunk in a short top-down scroller.
Controls:

- Sinclair/Kempston joystick,
- keyboard

Conclusion by Jungsi:
PTM is solidly made and the music is very fitting for a game of this type. The mix of sniper interludes and classic jump and run is successful. Since the graphics of the agent and the enemies are kept in black and white, there is no colour clash. Unfortunately, the replay value is not particularly high, so playing through once will be enough for most people.
Download at:

www.narwahl.itch.io/ptm

»DIZZY AND THE MUSHROOMS PIE«
BY VERM-V

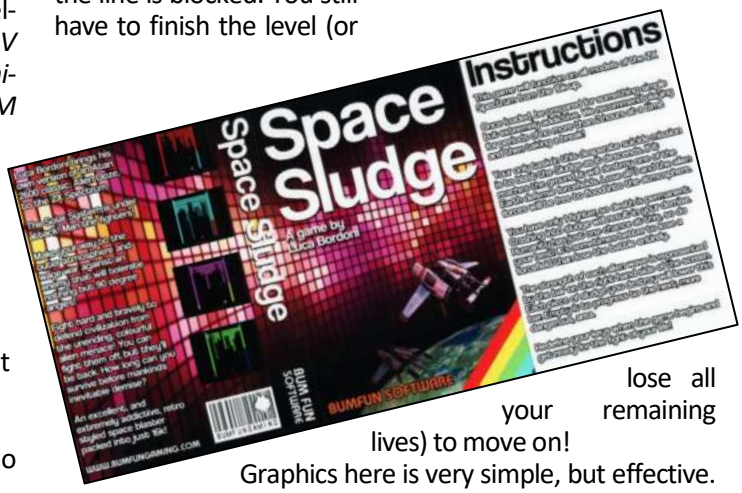
Dizzy And The Mushrooms Pie is a short game for all friends of the *Oliver Twins' Dizzy games*. The game was developed in Russia by *Verm-V* (original by *Alexandru Simion*), with music by *MmcM* and *Dizzy scripts* by *Hippiman*. In the game, *Dizzy* is controlled, trapped in a cave in search of mushrooms for Daisy.
The game is very simple with only 11 screens and a few puzzles. It was developed as a model and example to describe the possibilities of *DizzySE* (*Dizzy Scripting Engine*). The game has both simple scripts and is not very challenging, with the original game being one of the first games released on the *DizzyAge PC platform*.
Conclusion by Jungsi:
A typical *Dizzy game* recommended for beginners who want to get familiar with the mechanics of *Dizzy* games.
Download from:

https://yadi.sk/d/JqFehxWr4bky-A
(only TRD available).

COMMERCIAL SOFTWARE
SPACE SLUDGE
©2019 LUCA BORDONI, BUMFUN SOFTWARE

I don't think anyone can count how many times you saved the world from an alien invasion. You have always managed to blast your way through the hordes of space monsters comming out of nowhere, you've been the only reliable force preventing the apocalypse. That is the reason why everybody look at you now. You know this battle cannot be won, but you will make sure it won't be easy for them to get the Earth...

Welcome to *Space Sludge*. Like a *Tetris*, you know you cannot win, but I guarantee you that you will keep comming back. Just three keys and a frantic action makes this thing a constant hit. And here is why.
Game load is quite fast even from a tape as it work on every Spectrum with at least 16kB of RAM. There is no intro, just a simple menu, where you can define your keys (right, left and fire) and start the game. Very down the screen is highest score reached so far. Make your choice and I will wait for you in the main game.
For a moment you see a number of current level being played, then you're in the game. Your ship is down on the screen and you can move freely between two colour lines. Left one contain 3 stripes, those are your lives. Right one have a part of different colour, that is actually a counter of enemies you killed. Every succesfull shot will make small part of the coloured section disappear and when it's gone completely, you move to the next level. At the top you see growing field of squares. Those are the actual aliens and you have to shoot them. You won't shoot all of them as they keep appearing, but keeping an eye on the counter you know how long will it take to move on to the next level. And that's it. Simple, right?
Here is the catch. You can shoot just one shot at a time. And you cannot move while you're shooting (so, holding down the fire and moving around just doesn't work). Aliens also tend to form a stright lines going to very down. Once they reach the bottom, you lose a life and your way over the line is blocked. You still have to finish the level (or lose all your remaining lives) to move on!



Graphics here is very simple, but effective. Clever use of colours make things easy to watch and orientate, it look even good. Movement of the ship is very smooth and although there are two different widths of aliens, it is still easy to aim even for the tiny ones. Running from one side to another is fast enough and controls are really not a bottleneck of this game. There is no music, but a plenty of sounds adding to the feeling of a constant action.
If you have a couple of minutes, *Space Sludge* is a good choice to play, it's very easy to get into and there is constant feeling of "just one more try".
Being a conversion of homebrew game Alien Ooze from Atari 2600, Luca Bordoni did a splendid job of transfering the atmosphere and frantic action to the good old Speccy.
You can buy the game at *Bumfun Software*:

https://bumfungaming.com/shop/zx-games/space-sludge/

DEMOS

The year 2020 was extraordinary bad. COVID-19 closed most of all aspects of our lives and in the waters of demo scene it closed nearly all demo parties.
Some went online providing at least a stream of competitions and seminars, many of them simply closed down, hopefully not for good. This all mean there
were less demos released then usually. Although very different, it was far from being boring and I would call the 2020 - a year of a tinny intros. Let's go through some of the things you definitely shouldn't miss.

»SHADEBOBS SQUAREPIXELS« BY HOOY PROGRAM

Let's start in January. *Gasman* released a small demo to show his new graphic mode in action. It contain a text scroll, music and a shadebobs effect. There is not much of CPU time left for anything else, but it give a glimpse how the graphic mode look like in action instead of just being used for a static screens. It require a 128K Spectrum and took a second place in *oldschool compo* on *Rsync 2020* party.
Download at:

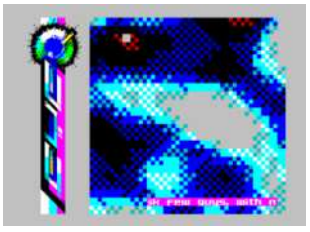
https://files.zxdemo.org/f/202001/hprg-shadebob_squarepixels.zip

»LO-FI MOTION« BY TARGET TEAM

Still in January, this demo won the *LowEnd Demo* competition on *DiHalt Lite*. It is fast paced demo build on the effects that runs in (half) attributes. Together with a good music, this is really nice start of a year and worth to spent some minutes on! It require 128K Spectrum.
Download at:

https://events.retroscene.org/files/dhl2020/lowend_demo/lo_fi_motion.zip

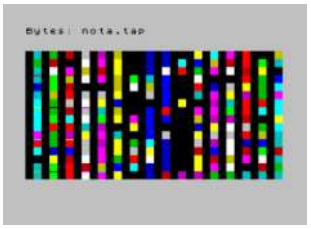
»EPILOGUE« BY EYE-Q



Still on *DiHalt Lite* and second place in *LowEnd Demo*. This is what I call a proper scene release - if you want to quit, do it with a style! This nice one-screen intro is here to tell us that *Eye-Q* group is no more and this is their last release. Attribute plasma, nice logo and a simple text scroll glued together with a good music make it a good one to watch. And hey, check out the colours, those were picked-up really carefully!
Download at:

https://files.scene.org/view/parties/2020/dihaltlite20/lowend_demo/epilogue.zip

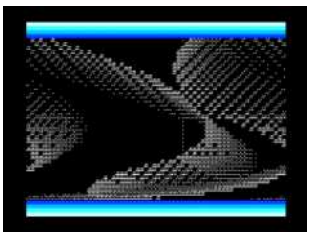
»NOTABLE 12B« BY GOBLINISH



This is first tiny intro we're looking at. And by tiny I mean very tiny, it is just 12 bytes. Not too much is happening on the screen, but it also contain not too much of code, so I would consider this a pretty clever way of filling in the screen. And if you are curious how it was done, there are sources in the download archive and it run on everything from Speccy 48K up.
Download at:

http://g0blinish.ucoz.ru/demo3/not12b.ZIP

»4INIK« BY GOBLINISH



And another intro, this time it's 1024 bytes. This intro was originaly made for *Forever 2020*, but the party was cancelled. What we get here are 4 different effects in one tiny intro. They show in chunky graphics, let it run in a loop and some effects may actually change every time they appear. No music or sound though, intro run on anything, from 48K Spectrum up.
Download at:

http://g0blinish.ucoz.ru/demo3/fo20/4in1k.zip

»SILLY VENTURE 2020 INVITATION« BY AGENDA

Silly Venture is end-of-year *Atari demoparty* happening every year in Poland and here we have invitation intro for it on the Spectrum. *Agenda* is well known group on Atari and we have a chance to see what they can do with Z-80 powerhouse. It is a 1024 bytes of heavy computing, we get a landscape in slow motion with some beeps, pretty impressive for it's size (intro require 128K Spectrum)! Let's hope it was not their last try and we will see more from *Agenda* in the future.
Download at: ***https://mechanism.fr/misc/sv2020.tap***

»RAPTOR DEMO« BY ALKO

This is a bit different. Not heavy on the effects, this demo tell a story in pictures about how important can a Spectrum be. There is a nice tune, good graphics and it is overall enjoyable work. Unfortunately, there is just SNA file for download (it won't play music in Fuse emulator as it will set-up the computer for 48K without AY chip).
Download at:

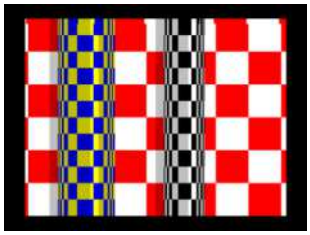
https://zx-pk.ru/threads/31619-raptor-demo.html

»ACNEWS #73« BY CONSCIENCE

This is something different, a long running diskmag that is being published by *Alone Coder*. It is not heavily packed with articles (there are just 3 of them and only 2 of those are translated into English), but it is a nice overview what is new in the east. After loading, pressing 1 and 3 will take you to the English articles, move around the text using cursor keys.
Download at:

http://alonecoder.nedopc.com/zx/books/ACN73.zip

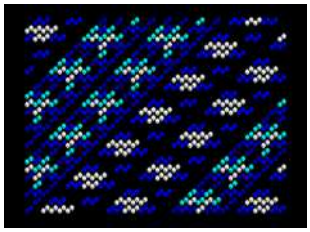
»ROLL ME GENTLY« BY JOKER



Here we have another tiny intro, now it's just 256 bytes. Just run it, first impression is just great. It is colourful, it's moving, there are even beeps (bit annoying after a while). A well spent 1 quarter of a kilobyte that require 128K Spectrum. Intro took 2nd place in combined 256 intro competition on *Flashparty 2020*.
Download at:

https://files.scene.org/view/parties/2020/flashparty20/256b_retro_alternative_intro/joker-roll_me_gently.zip

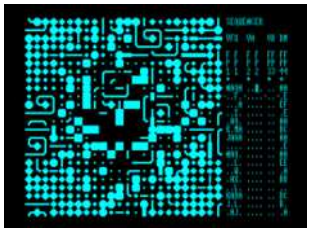
»FLUXUS« BY MARQUEE DESIGN



Another intro, another 256 bytes doing wonders. This is a bit special for two reasons; firstly, it is first production of the author on the Spectrum created in about 10 days to learn new platform. That is impressive enough itself, but secondly, it look just wonderfull. Cleverly chosen colours make all the patterns look just beautifull. There is even a sound on a 128K Speccy. No TAP in archive, but it is enough if you load a BIN file into the memory to address 32768 and run it from there. Intro took 1st place in combined 256 intro competition on *Flashparty 2020*.
Download at:

https://files.scene.org/view/parties/2020/flashparty20/256b_retro_alternative_intro/marquee_design-fluxus.zip

»ZXAV« BY ATE BIT



There are releases that are easy to categorise. And then there are releases which are not. Here we have one such and instead of trying to find my own words, I will just copy what it's author said: "This is an audio/visual sequencer for the ZX Spectrum. It's sort of a demotool, sort of a wild release, sort of a... uncategorisable demoscene-related thing." The archive come with a full manual in PDF and quite a few example snapshots of what the tool can be used for. (SZX files are snapshots created by Fuse emulator). Oh, did I mentioned that this whole thing is done in just 4K? Yes, that's 4096 bytes. If you have few minutes to spend and you're not in a mood to play games, give it a try. But beware that few minutes may become... you know what I mean!
Download at: ***http://atebit.org/downloads/zxav.zip***

»CLIVE« BY MARQUEE DESIGN

This is second attempt on the Speccy, a small intro to celebrate *Sir Clive's 80th birthday*. Again a 256 bytes of evolving patterns, done in good colours and on a 128K Spectrum also with a bit of sound. Intro took 1st place in *ZX Demo* competition on *Decrunch 2020*.
Download at:

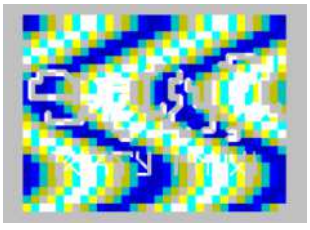
https://marquee.revival-studios.com/releases/marqueedesign_clive.zip

»ROLL ME GENTLY: INVITE REMIX« BY JOKER

If you want to see what happen if you move the size limit from 256 bytes to the huge 4096 bytes, check out this intro. Updated version of previously mentioned *Roll Me Gently* is a huge difference! A great music, improved effect with a lot of variety, the intro look more like a stand-alone part of some old megademo then a tinny intro. And it is also an invitation for Speccy.pl party. (They released 11 different invitation intros for the party, but it was cancelled due COVID-19, sadly). Need Spectrum 128K. This intro took 8th place in Wild demo competition on *Decrunch 2020*.
Download at:

http://www.jokerteam.pl/RollMeGentlyInviteRemix.zip

»COVIDATION 2 PARTY« BY RETROKOMP/LOADERROR



Another invitation for *Speccy.pl party*, this time it's a demo. Not huge, not jaw dropping, but a quite nice to look at with good music. It took second place on *Decrunch 2020 demoparty* in *ZX Demo* competition and run on everything from Spectrum 48K up. Demo took 2nd place in *ZX Demo* competition on *Decrunch 2020*.
Download at:

https://files.scene.org/view/parties/2020/decrunch20/demo_zx/zx48kay-covidation_2_party.zip

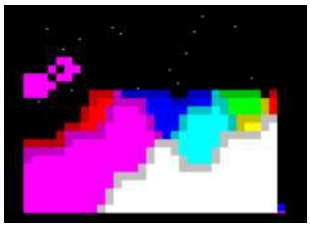
»SCHNEIDER« BY PENISOFT

This one doesn't look any special, but in a way it still is. It is a small music disk, dedicated to *Florian Schneider*, a member of famous *Kraftwerk* band, who sadly passed away in 2020. We have here 10 music's for AY that were created...

Well, those musics are converted MOD files from Amiga. Not by hand, but by a tool. And how does it sound? Well, go and check it out! Demo require Speccy 128K (it run on 48K too, but most musics are missing then).
Download at:

https://files.scene.org/view/demos/groups/penisoft/schneider.zip

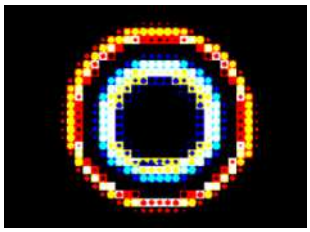
»MAGENTA BARON« BY JOKER



Another 256 bytes intro full of colours. It's a fly by over a randomly generated landscape, with paralax stars and annoying beeps. But it do look nice and the clever use of BRIGHT make it easy to recognize what is going on. Work on anything from Speccy 48K up. Intro took 4th place in Combined Intro competition on *InérciaDemoparty 2020*.
Download at:

https://files.scene.org/view/parties/2020/inercia20/combined_tiny_intro/joker_-_magenta_baron.zip

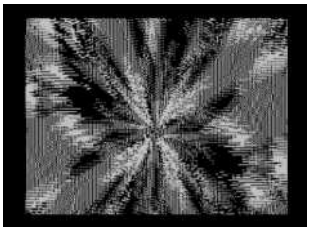
»MAKES SENCE« BY GOBLINISH



And here we go, there is a demo finaly! It is not super original nor breaking any records, but hey, it is a full-scale demo to watch, a thing that was so scarse in 2020! *G0blinish* is serving us smooth effects with a good music, there is not much I can say against what was done here. Go and grab it, you won't regret! Demo took 3rd place in *oldschool demo competition* on *Demosplash* 2020.
Download at:

http://g0blinish.ucoz.ru/demo3/ds20/makessence.zip

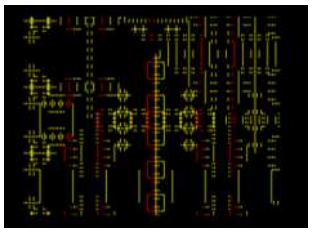
»THIS IS ⚙ [DIGITAL INVASION]« BY SERZHSOFT



How to crash your computer in 256 bytes. Or maybe how to crash your mind in just 256 bytes. *Serzh* is a master of tinny *megademos* and here we have a stripped down one-effect intro. It run on anything from Speccy 48K up and it start with a mess in both, border and paper. Just give it a while, it's just preparing the effect. You see? I think you may spend some time with this one. This intro took 1st place in combined 256 intro category on *Demodulation 2020* demoparty.
Download at:

https://ftp.untergrund.net/users/havoc/POUET/zx/this_is.zip

»ALIEN RADIO« BY INSIDERS



We will end our way through the demoscene year of 2020 with a small story. Alien Radio is a 256 bytes intro about alien music. There is a small explanation right before the intro start, so I won't repeat it here. I personaly think it is an interesting idea and quite impressive for it's size. Intro took 4th place in combined 256 intro competition on *Demodulation 2020*.
Download at:

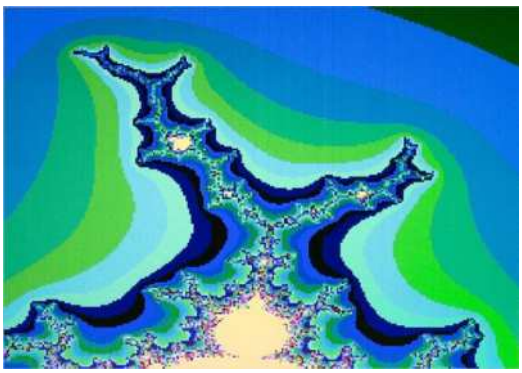
https://introspec.retroscene.org/friends/alienradio.zip

BASIC GIMMICK FOR NEXT
BY CRISTOF ODENTHAL

The "Mandelbrot" fractal for the ZX SPECTRUM NEXT with 28 MHz and (up to) 256 colours without "colour clash". The graphic is displayed more and more finely in eight runs and saved at the end. Line 40 + 60: Virtual resolution 2330 x 1747 (detail from 1537, 200). Line 140 Calculation depth and number of colours, Lines 90 + 100 Abbreviation for repetitions. Reload graphic with line 190.

```
 10    RUN AT 3: LAYER CLEAR: BORDER 7:
       LAYER 2,1: CLS
 20    FOR %n=0 TO 7
 30    FOR %b=%n TO 191 STEP 8
 40    LET q=%b+200: LET q=q/1747:
       LET q=-1.5+q+q+q
 50    FOR %a=0 TO 255
 60    LET p=%a+1537: LET p=p/2330:
       LET p=-2.25+p+p+p
 70    LET x=0: LET y=0: LET c=0: LET d=0:
       LET u=0: LET v=0:  LET %k=0
 80    LET y=x*y: LET y=y+y+q: LET x=c-d+p
 90    IF %k MOD 24=0 THEN LET u=x: LET v=y:
       GO TO %110
100    IF ABS (x-u)<0.000001 AND
       ABS (y-v)<0.000001 THEN LET %k=255:
       GO TO %150
110    LET c=x*y: LET d=y*y
120    IF c+d>100 THEN GO TO %150
130    LET %k=%k+1
140    IF %k<255 THEN GO TO %80
150    LET %i=%(k*3) MOD 256:
       PLOT INK %i;%a,%b: DRAW INK %i;0,%7-n
160    NEXT %a: NEXT %b: NEXT %n
170    SAVE "Mandel.SL2" LAYER
180    REPEAT : BORDER 2: PAUSE 30: BORDER 3:
       PAUSE 30: REPEAT UNTIL INKEY$ <>"":
       LAYER 2,0: LAYER 0: STOP
190    LAYER 2,1: LOAD "Mandel.SL2" LAYER:

       PAUSE 0: CLS : LAYER 2,0: LAYER 0
```



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